AERMEC

air conditioning

ELECTRONIC REGULATION

SERVICE MANUAL

MODUCONTROL

UP TO SOFTWARE VERSION 4.1

AERMEC

COMPANY QUALITY SYSTEM

ICIM

ISO 9001:2000 - Cert. n° 0128/5

CISQ IQNet

AERMEC S.P.A.

CE

GB

Software evolution

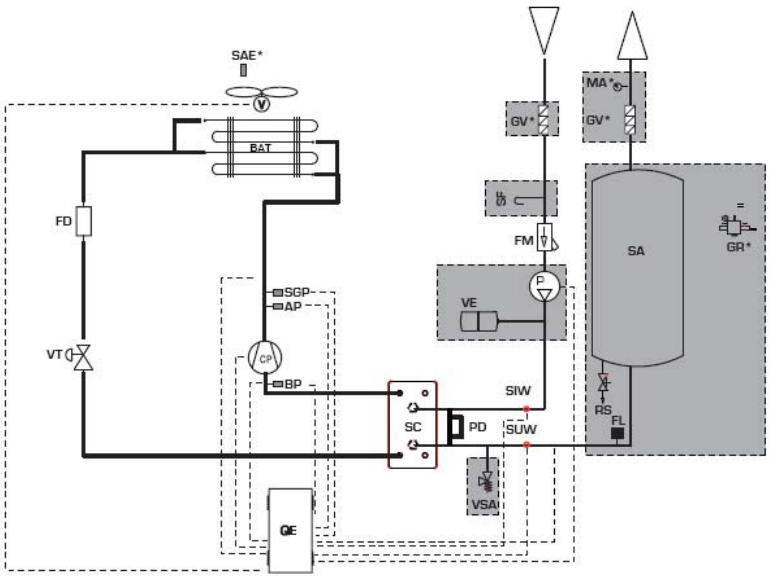
Ed	Pann.	Sw Pann.	Base	Sw Base	Data	Autore	Note
					16-10-2006	F.Bonato	
1	34164.00	02900 im00 pan1_0_1.s19	34163.00	02800 im 00 mod1_2.s19	19-10-2006	F.Bonato	
2	34164.00	02900 im00 pan1_0_1.s19	34163.00	02800 im 01 mod1_4.s19	14-11-2006	F.Bonato	
3	34164.00	02900 im00 pan1_0_1.s19	34163.00	02800 im 02 mod1_5.s19	21-12-2006	F. Bonato	
4	34164.00	02900 im 00 pan1_0_1.s19	34163.10	mod1_8.s19	05-05-2007	F. Bonato	
5	34164.00	02900 im 00 pan1_0_1.s19	34163.10	02800 im 03 mod20.s19	3-10-2007	F. Bonato	
6	34164.00	02900 im 00 pan1_0_1.s19	34163.10	02800 im 03 bl11mc35_0.s19	16-01-2008	F. Bonato	
7	34164.00	02900 im 00 pan1_0_1.s19	34163.10	02800 im 03 bl11mc36_3.s19	02-04-2008	F. Fortin	
8	34164.00	02900 im 00 pan1_0_1.s19	34163.20	02800 im 03 bl11mc37_0.s19	03-06-2008	F. Fortin	
9	34164.00	02900 im 00 pan1_0_1.s19	34163.20	02800 im 03 bl11mc37_0.s19	08-08-2008	F. Fortin	
10	34164.00	02900 im 00 pan1_0_1.s19	34163.20	02800 im 03 bl11mc37_4.s19	22-10-2008	F. Fortin	
11	34164.00	02900 im 00 pan1_0_1.s19	34163.70	02800 im 03 bl11mc37_5.s19	19-01-2009	F. Fortin	
12	34164.00	02900 im 00 pan1_0_1.s19	34163.70	02800 im 03 bl11mc39_0.s19	17-03-2009	F. Fortin	
13	34164.00	02900 im 00 pan1_0_1.s19	34163.70	02800 im 03 bl11mc40_0.s19	04-06-2009	F. Fortin	
14	34164.00	02900 im 00 pan1_0_1.s19	34163.83	mc41_0.s19	14-12-2009	F. Fortin	

SUMMARY:

Refrigerant circuits	4
Abbreviations description	10
Digital input / output	11
Serial card modu485	15
User interface	16
Readings menu	20
Procedure to parameters modification	22
User menu	23
Resistance menu	25
Installer menu	26
Maintenance menu	30
Factory menu	34
Compressor and pump menu	36
Microswitches	40
ON/OFF panel configuration	46
Thermostat regulation	47
Electric heaters	51
Compensation of setpoint	59
Compressor controls	60
Compressor times	61
DCPX	72
Defrost	75
ANL-C	79
Hot domestic water	80
Ambient thermostat TRA	82
Inverter pump	83
Expansion valve	86
Economizer	89
ANLI	90
ANLI defrost	96
Unit working procedure control	98
Alarms	107
Spare parts	114
Probes – trasducers – Freon tables	116

1.0 ANL – ANR –ANF - ANLI REFRIGERANT CIRCUITS

5.8. COOLING/HYDRAULIC ANL ° CIRCUITS

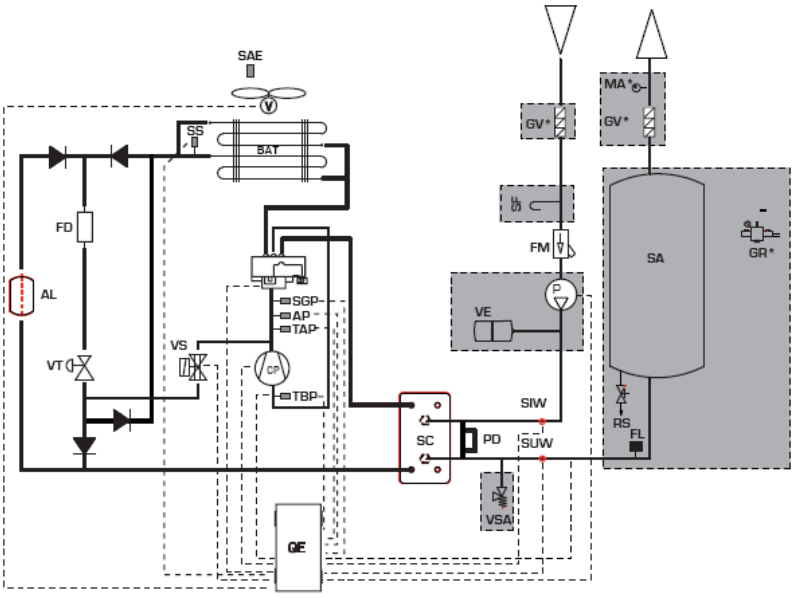


ANL * KEY	
CP	*Compressor*
TAP	*High pressure transducer*
AP	*High pressure pressure switch*
SGP	*Temperature pressing probe*
BAT	*Coil*
SAE	** External air temperature probe (with DCPX accessory)*
FD	*Filtro deshidratador*
VT	*Thermostatic valve*
•	*Produced water temperature up to 4°C*
Z	*Produced water temperature from 4°C to 0°C*
Y	*Produced water temperature from -1°C to -6°C*
SC	*Plate heat exchanger*

HYDRAULIC CIRCUIT COMPONENTS	
FM	*Fitted water filter*
PD	*Differential pressure switch*
SIW SUW	*Water inlet/outlet temperature probes*

* HYDRAULIC COMPONENTS NOT PROVIDED BUT RECOMENDED	
VE	*Expansion tank*
P	*Pump*
SF	*Manual air ventilation*
VSA	*Safety valve*
GV	*Anti-vibration joints*
FL	*Water flow switch*
SA	*Storage tank*
RS	*Storage discharge*
GR	*Priming unit*
MA	*Pressure gauge*

CIRCUITI ANL H

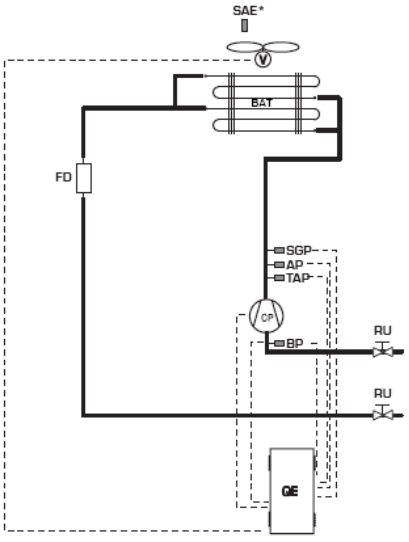


ANL H KEY	
CP	*Compressor*
TAP	*High pressure transducer*
AP	*High pressure pressure switch*
SGP	*Temperature pressing probe*
VIC	*Cycle reversing valve*
BAT	*Coil*
SAE	*External air temperature probe*
SS	*Defrosting probe*
FD	*Dehydrator filter*
AL	*Liquid storage*
VT	*Thermostatic valve*
•	*Produced water temperature up to 4°C*
Z	*produced water temperature from 4°C to 0°C*
Y	*produced water temperature from -1°C to -6°C*
VS	*Solenoid valve*
SC	*Plate heat exchanger*
TBP	*Low pressure transducer*

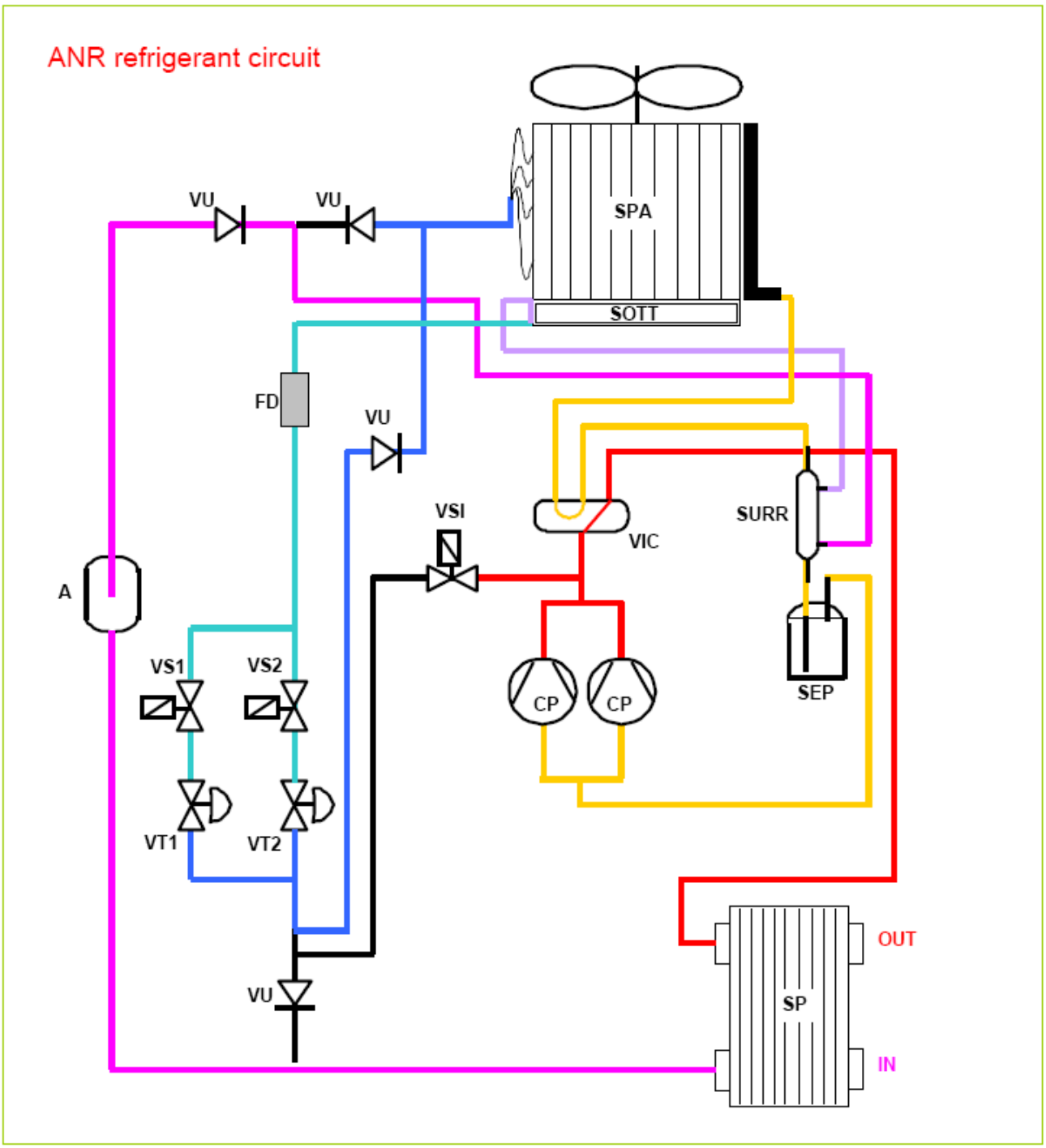
HYDRAULIC CIRCUIT COMPONENTS	
FM	*Fitted water filter*
PD	*Differential pressure switch*
SIW SUW	*Water inlet/outlet temperature probes*

HYDRAULIC COMPONENTS NOT PROVIDED BUT RECOMENDED	
GV	*Anti-vibration joints*
SF	*Manual air ventilation*
P	*Pump*
VE	*Expansion tank*
VSA	*Safety valve*
FL	*Water flow switch*
SA	*Storage tank*
RS	*Storage discharge*
GR	*Priming unit*
MA	*Pressure gauge*

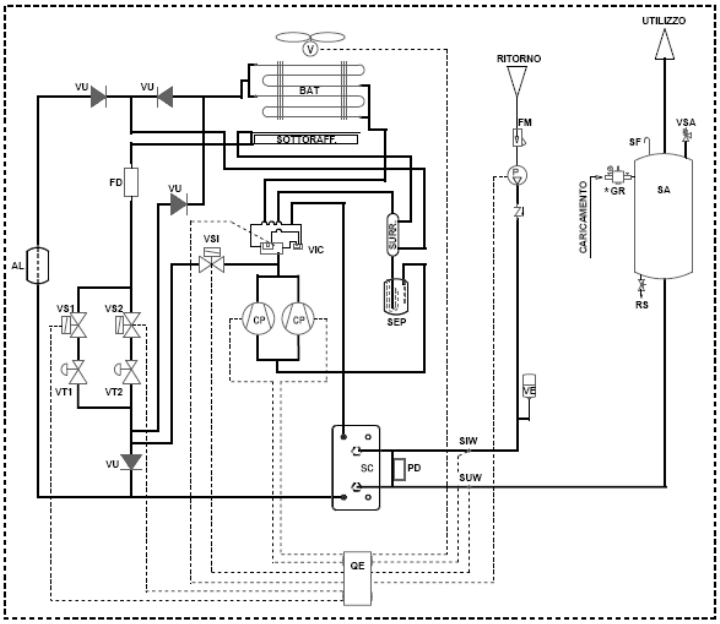
ANL C CIRCUIT



ANL * C KEY		
CP	*Compressor*	
TAP	*High pressure transducer*	
AP	*High pressure pressure switch*	
SGP	*Temperature pressing probe*	
BAT	*Coil*	
SAE	** External air temperature probe supplied with DCPX*	
FD	*Dehydrator filter*	
RU	*Taps*	
Ø	***Liquid line***	***Gas line***
020	*15,88*	*9,52*
025	*15,88*	*9,52*
030	*15,88*	*12,7*
040	*15,88*	*12,7*
050	*22*	*15,88*
070	*22*	*15,88*
080	*22*	*15,88*
090	*28*	*15,88*


ANR refrigerant circuit
SPA
SOTT
VU
VU
FD
VU
VSI
VIC
SURR
A
VS1
VS2
CP
CP
SEP
VT1
VT2
VU
OUT
SP
IN

ANR (HA)

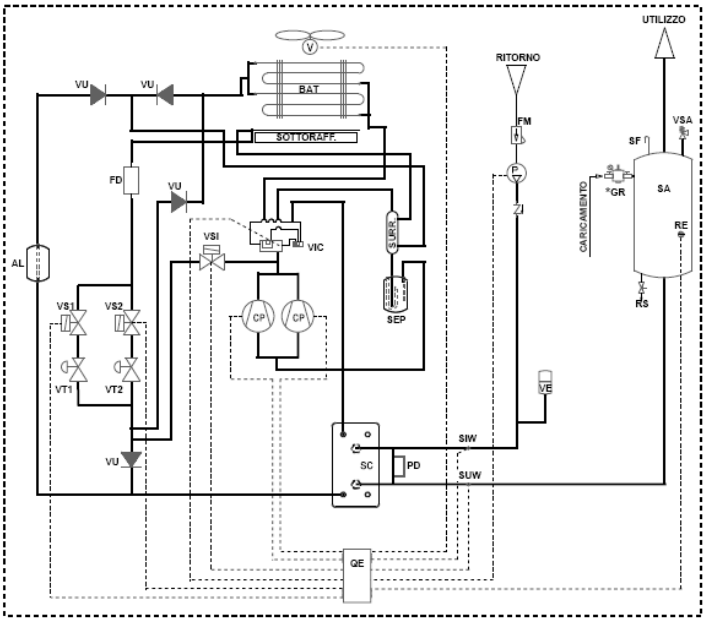


KEY

CP: compressor
VU: one-way valve
VT: thermostatic valve
VS: solenoid valve
VIC: cycle reversing valve
BAT: Coil
FD: filter-drier
AL: liquid accumulation
SEP: liquid separator
V: fan
SC: exchanger
VE: expansion tank
VSA: water safety valve
VaS: ball valve
SA: water tank
SF: drain
SD: antifreeze sensor
RS : discharge tap
SIW: water temperature control input sensor
SUW: water temperature control output sensor
QE: electric panel/modu control
PD: differential pressure switch

NB:
* GR: filling unit, not provided, but element recommended
--- Elements inside the machine

ANR (HK)

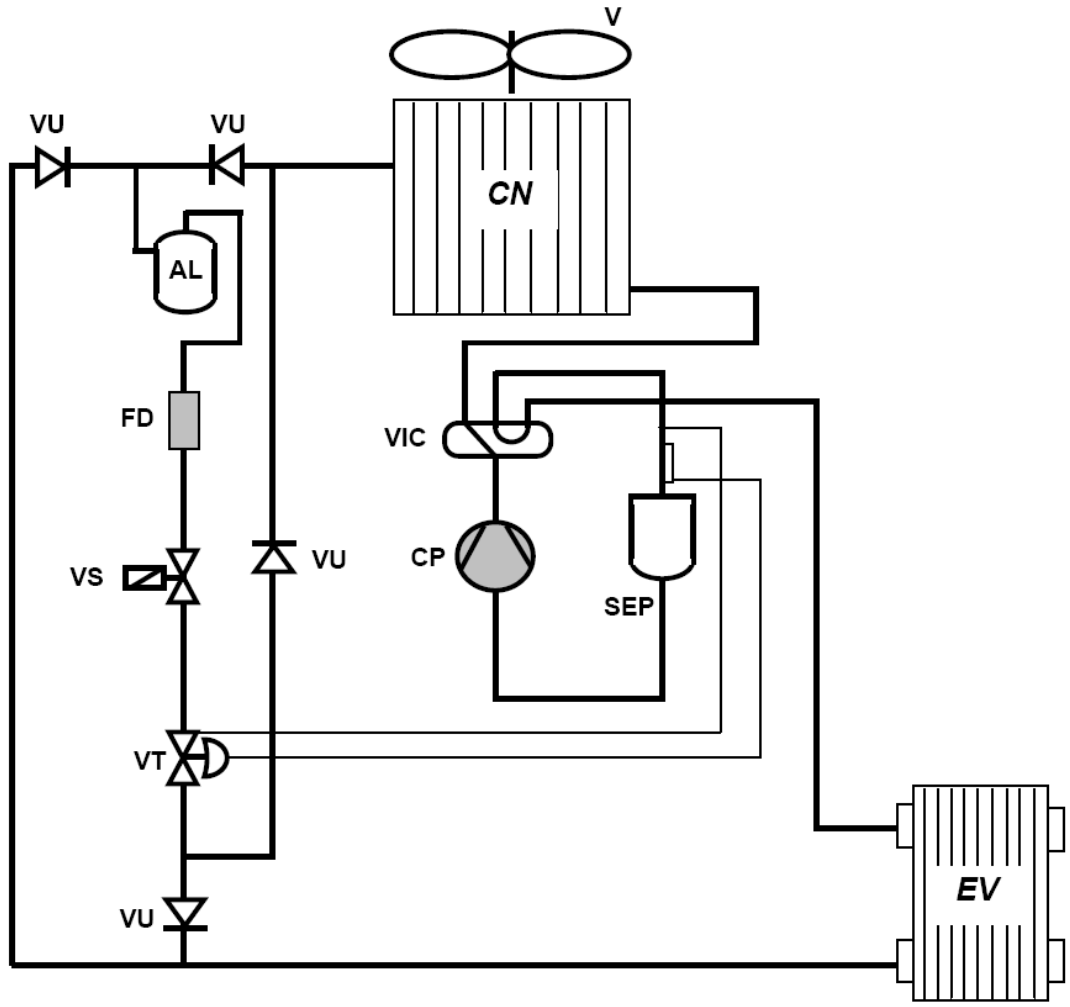


KEY

CP: compressor
VU: one-way valve
VT: thermostatic valve
VS: solenoid valve
VIC: cycle reversing valve
BAT: Coil
FD: filter-drier
AL: liquid accumulation
SEP: liquid separator
V: fan
SC: exchanger
VE: expansion tank
VSA: water safety valve
VaS: ball valve
SA: water tank
SF: drain
SD: antifreeze sensor
RE: electric heaters
RS : discharge tap
SIW: water temperature control input sensor
SUW: water temperature control output sensor
QE: electric panel/modu control
PD: differential pressure switch

NB:
* GR: filling unit not provided, but element recommended
--- Elements inside the machine

ANF



VU: one way valve **AL: refrigerant accumulator**

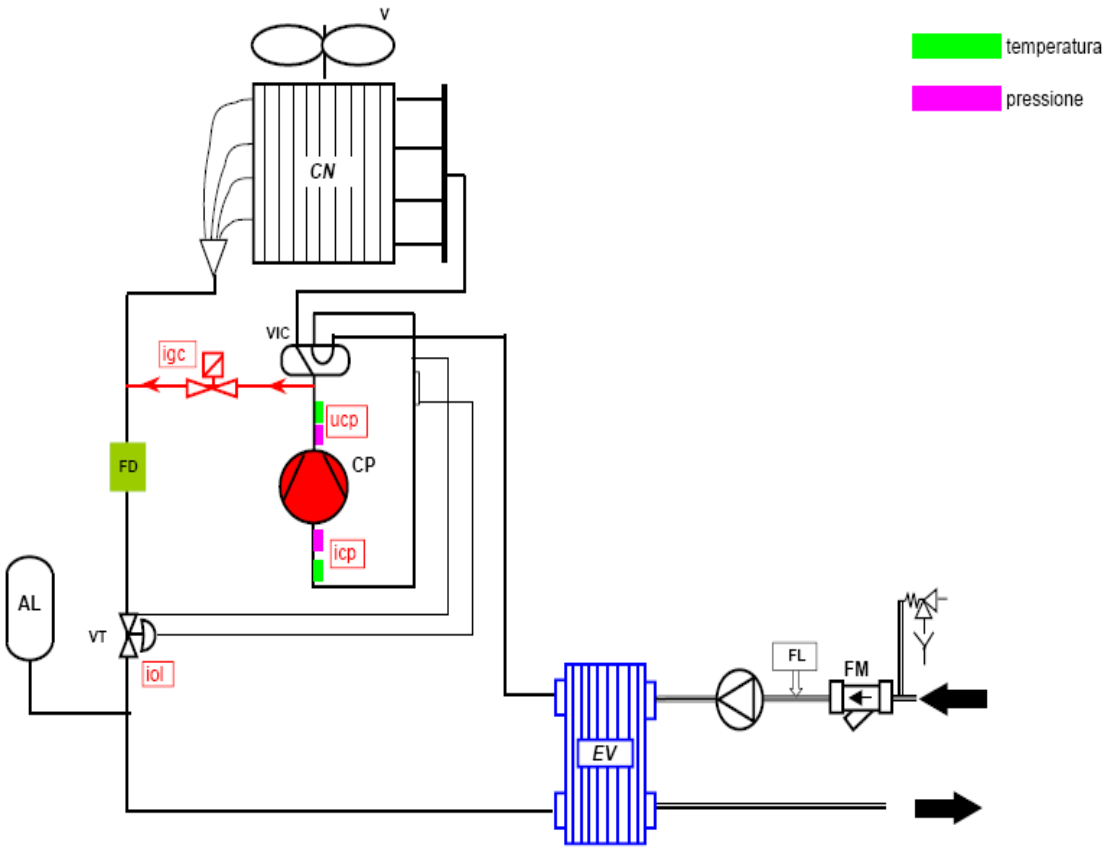
FD: refrigerant filter **VT: expansion valve**

VIC: 4 way valve **CP: compressors**

IDL: liquid glass **SEP: liquid separator**

VS: solenoid valve (VS1=only 1cp on, VS2=2 cp on)

ANLI with inverter compressor to R410A



Picture 4 - ANLI heat pump version

V:	fans
CN:	aircoil
VIC:	4 way valve
AL:	refrigerant accumulator
VT:	electronic expansion valve
FD:	refrigerant filter
FM:	water filter
FL:	flow switch
	EV. evaporator
Icp:	suction trasducer and probe
Ucp:	discharge trasducer and probe
Igc:	hot gass injetion solenoid valve (works only in heating mode)

Table 1 – Description of abbreviations

Parameter relative abbreviation	Parameter	Parameter relative abbreviation	Parameter
CP	Compressor output	**MTV**	Digital input fan circuit braker
CPA	Second compressor output	**MTC**	Digital input compressor circuit braker
MPO	Pump digital output	**AP**	Free contact about compressor contactor status (It used like high pressure switch)
MV	Fan Output	**MTCA**	Digital input second compressor circuit braker (not used)
VIC	4 way valve output	**IA**	Digital input ausiliary circuit braker
VGC – VSB – VSI	Hot gas injection valve output	**C/F**	Digital input cooling/ heating
RA	Antifreeze heater output	**SUW**	Outlet water probe
DCP1	Fan speed regulation analogic output	**SIW**	Inlet water probe
DCP2	Fan speed regulation analogic output	**SS**	Defrost probe
AE	General alarm output	**SAE**	External air probe
SSR-RCR	Output to manage relay solid status (**electric heaters**)	**SGP**	Discharge gas probe
BP	Low pressure switch digital input	**TAP**	High pressure trasducer
FL	Flow switch / differential switch digital input	**TBP**	Low pressure trasducer
MTP	Circuit braker water pump digital input		

Table 2 – Digital imputs / outputs

Id	terminals phase / V+ Neutral / gnd	Type	Electric features	Used for
Digital outputs				
C1	**M1S - 1** **M1 - 1**	digital output relay 230 Vac	12 Amp ohmmics, 4 Amp inductives	Fan (**MV**)
C2	**M1S - 2** **M1 - 2**	digital output relay 230 Vac	12 Amp ohmmics, 4 Amp inductives	Water pump (**MPO**)
C3	**M1S - 3** **M1 - 3**	digital output relay 230 Vac	8 Amp ohmmics, 2 Amp inductives	Antifreeze heaters **RA**
C4	**M1S - 4** **M1 - 4**	digital output relay 230 Vac	8 Amp ohmmics, 2 Amp inductives	Compressor (**CP**)
C5	**M1S - 5** **M1 - 5**	digital output relay 230 Vac	8 Amp ohmmics, 2 Amp inductives	compressor n.2 (**CPA**) **Or heating wire parameter(1)=1 new menu pasw=31**
C6	**M1S - 6** **M1 - 6**	digital output relay 230 Vac	8 Amp ohmmics, 2 Amp inductives	4 way valve (**VIC**)
C7	**M1S - 7** **M1 - 7**	digital output relay 230 Vac	6 Amp ohmmics, 1.5 Amp inductives	Hot gas injection valve (**VGC**) **Or heating wire parameter(1)=2 new menu pasw=31**
AE	**M1S - 8** **M1 - 8**	Digital output relay 230 Vac	6 Amp ohmmics, 1.5 Amp inductives	Alarms status (**AE**)
SSR	**M5 - 1** **M5 - 2**	Digital output 15 Vdc	Max. current 13 mA CC	Output relay **RCR** for Integration heater or boiler
Analogic outputs				
DA1	**M6S**.1 **M6S**.2		Max load 1 Kohm	**ECONOMIZER**
DA2	**M6**.1 **M6**.2	analogic output 0-10 V	Max load 1 Kohm	**DCP1**(fan speed control)

Digital inputs				
ID1	**M7 - 1** **M7 - 2**	Free contact	Supplied from board to 15 Vac	circuit brakers (**MTC – MTV - MTP**)
ID2	**M7 - 3** **M7 - 4**	Free contact	Supplied from board to 15 Vac	Flow switch/differential pressure switch (**FL/PD**)
ID3	**M7 - 5** **M7 - 6**	Free contact	Supplied from board to 15 Vac	Fan or pump circuit braker (**MTP/MTV**) Ambient thermostat **TRA** (**open=CP/RES/PUMP off**)
ID4	**M7 - 7** **M7 - 8**	Free contact	Supplied from board to 15 Vac	Status compressor contactor used like HP switch signal (**HP**)
ID5	**M7S - 1** **M7S -2**	Free contact	Supplied from board to 15 Vac	LP pressure switch (**LP**)
ID6	**M7S - 3** **M7S - 4**	Free contact	Supplied from board to 15 Va	Fan circuit braker (**MTV**) **TWS** thermostat ECS-HDW (**closed ECS ON**)
ID7	**M7S - 5** **M7S - 6**	Free contact	Supplied from board to 15 Vac	Auxiliary external contact (Closed = unit ON) (**I/A**)
ID8	**M7S - 7** **M7S - 8**	Free contact	Supplied from board to 15 Vac	Cooling/heating contact (closed = unit in cooling) (**C/F**)
Voltage supply				
N	**M2 - 1**	Voltage phase input	230 Vac +/- 10%, 50/60 Hz	
L	**M2 - 2**	Voltage neutral input		
15V	**M5S - 1**	Ausiliary voltage supply DC 15 Vdc V+	Max 13 mA DCi	
0V	**M5S - 2**	Ausiliary voltage supply DC 15 Vdc V+		

Analogic inputs				
NTC1	**M9 - 1** **M9 - 2**	Inlet probe ntc	Characteristic ntc: 10 Kohm a 25°C	Inlet water probe (**SIW**) **ANL-C**: unit ON if contact closed
NTC2	**M9 - 3** **M9 - 4**	Inlet probe ntc	Characteristic ntc: 10 Kohm a 25°C	Outlet water probe (**SUW**) **ANL-C** antifreeze if contact closed
NTC3	**M9 - 5** **M9 - 6**	Inlet probe ntc	Characteristic ntc: 10 Kohm a 25°C	Defrost probe (**SS**) **ANL-C** 50% if contact closed
NTC4	**M9S - 1** **M9S - 2**	Inlet probe ntc	Characteristic ntc: 3.3 Kohm a 25°C	Discharge gas probe (**SGP**)
NTC5	**M9S - 3** **M9S - 4**	Inlet probe ntc	Characteristic ntc: 10 Kohm a 25°C	External air probe (**SAE**)
In 0-10V	**M9S - 5** **M9S - 6**	Digital input from 0 to 10 volt		0-10 V input to generic applications (max.15 mt)
V+	**M8 - 1**	Output voltage to transducer 5Vdc ANL version	5 Vdc output	
GND	**M8 - 2**	Ground to trasducer	Ground	
SIGN	**M8 - 3**	Input to trasducer signal		HP trasducer signal (0.5V-4.5V) (**TAP**)
Vout	**M8 - 4**	Output to trasducer (4-20mA) **NOT USED**	Output voltage 8-28 Vdc	
V+	**M8S - 1**	Output voltage to transducer 5Vdc ANL version	5 Vdc output	
GND	**M8S - 2**	Ground to trasducer	Ground	
SIGN	**M8S - 3**	Input to trasducer signal		LP trasducer signal (0.5V-4.5V) (**TBP**)
Vout	**M8S - 4**	Output to trasducer (4-20mA) **NOT USED**	Output voltage 8-28 Vdc	

Serial connections				
6P6C	**M3**	Simple serial panel	Connector RJ11 6P6C to simple panel	Simple connector
RS485	**M4S** **M4S - 1 (A)** **M4S - 2 (B)** **M4S - 3 (GND)**	Serial connector	Differential output serial signals	Remote display connector or inverter serial communication
ALARM	**M4 - 1**	Output signal alarm	Free contact	
V-EXT1	**M4 - 2**	Remote display power supply	output 13 Vac	
V-EXT2	**M4 - 3**	Remote display power supply 0V	output 13 Vac	
Dip switches				
SW				Dip switches to configurate the unit version
1 , 2				Trasducers selector

2: SERIAL CARD: MODU-485A (8 data bits, parity none, 2 stop bit)

MODU-485A

AMODU485AUJ - 6205700

AERMEC air conditioning

IT Espansione seriale 485:

La scheda MODU-485A è un'opzione del controllore elettronico MODUCONTROL che permette l'interfacciamento diretto di quest'ultimo ad una rete RS485.Una volta installata, la scheda soddisfa le norme applicate per il controllo MODUCONTROL. La scheda garantisce l'optoisolamento del controllore rispetto alla rete seriale RS485.Il baud rate massimo ottenibile è di 38400 baud (impostabile via software).

Installazione:

- La scheda, una volta tolta dall'imballo, deve essere installata nello slot corrispondente della scheda Modu_control (Fig. A);
- Occorre togliere lo sportellino tramite l'utilizzo di un cacciavite o similare (Fig. B);
- Tramite una pinza/trancino occorre tagliare i 4 sostegni della chiusura, in modo da aprire la feritoia per il passaggio del connettore dell'espansione (Fig. C);
- Occorre ora individuare la posizione per installare correttamente la scheda. Essa deve essere inserita nel connettore a vaschetta indicato (Fig. D);
- Dopo aver tolto la connessione estraibile, inserire la scheda MODU_485A con il connettore rivolto verso l'esterno, fino all'avvenuto "click" della morsettiera;
- Richiudere infine il foro con lo sportellino (Fig. E).

EN Serial 485 expansion:

The MODU_485A board is an optional of the MODUCONTROL electronic controller that allows the direct interfacing of the latter to a RS485 network. Once installed, the board satisfies the Standards applied for the MODUCONTROL control. The board guarantees the optical isolation of the controller with respect to the RS485 serial network. The maximum baud rate that can be obtained is 38400 baud (settable via software).

Installation:

- Once the board has been removed from the packaging, it must be installed in the corresponding slot in the Modu_control board (Fig. A);
- Remove the hatch using a screwdriver or similar tool (Fig. B);
- Use pliers/small cutter to cut the 4 closure supports in a way to open the slot for the passage of the expansion connector (Fig. C);
- Now identify the position for correct installation of the board. It must be inserted into the tank connector indicated (Fig. D);
- After having removed the extractable connection, insert the MODU_485A board with the connector facing outwards, until the "click" of the terminal board;
- Finally close the hole with the hatch (Fig. E).

FR Extension série 485:

La carte MODU_485A est une option du contrôleur électronique MODUCONTROL qui permet l'interface directe de ce dernier à un réseau RS485. Une fois installée, la carte répond aux normes appliquées pour le contrôle MODUCONTROL. La carte garantit l'opto-isolation du contrôleur par rapport au réseau série RS485. Le baud rate maximum qui peut être obtenu est de 38400 baud (configurable par logiciel).

Installation:

- Après avoir retiré la carte de l'emballage, il faut l'installer dans le slot correspondant de la carte Modu_control (Fig. A);
- Il faut retirer le panneau à l'aide d'un tournevis ou similaire (Fig. B);
- À l'aide d'une pince/coupeuse, il faut couper les 4 supports de la fermeture pour ouvrir la fente destinée au passage du connecteur de l'extension (Fig. C);
- À présent, il faut identifier la position pour installer correctement la carte. Celle-ci doit être insérée dans le connecteur indiqué (Fig. D);
- Après avoir retiré la connexion amovible, insérer la carte MODU_485A avec le connecteur dirigé vers l'extérieur jusqu'au "clic" du bornier;
- Refermer ensuite l'orifice avec le panneau (Fig. E).

DE Serielle 485-Erweiterung:

Die Erweiterungskarte MODU_485A ist eine Option des elektronischen Controllers MODUCONTROL, mit der ein direkter Anschluss dieses Controllers an ein RS485-Netzwerk möglich ist. Nach der Installation erfüllt die Karte die für die MODUCONTROL-Steuerung angewandten Normen. Die Karte gewährleistet die optische Isolierung des Controllers vom seriellen RS485-Netzwerk. Die maximal erreichbare Baudrate beträgt 38400 Baud (über Software einstellbar).

Installation:

- Die Karte ist nach dem Entfernen der Verpackung in den entsprechenden Schacht der Modu_control-Karte einzustecken (Abb. A);
- Die Klappe ist mittels eines Schraubenziehers o. ä. zu entfernen (Abb. B);
- Die 4 Halter des Verschlusses müssen mittels Zange/Seitenschneider durchgeschnitten werden, um den Schlitz zur Durchführung des Steckverbinders der Erweiterungskarte zu öffnen (Abb. C);
- Nun ist die Position zur richtigen Installation der Karte zu ermitteln. Diese ist in den angegebenen Steckverbinder einzusetzen (Abb. D);
- Nach Entfernung der herausziehbaren Verbindung ist die Karte MODU_485A mit nach außen zeigendem Steckverbinder einzustecken, bis sie mit hörbarem "Klick" in der Klemmleiste eingerastet ist.
- Öffnung mit der Klappe wieder verschließen (Abb. E).

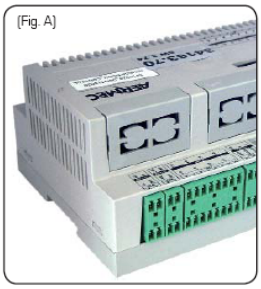
ES Expansión serial 485:

La tarjeta MODU_485A es una opción del controlador electrónico MODUCONTROL, que permite la conexión directa de este a una red RS485. La tarjeta, una vez instalada, satisface las normas aplicadas para el control MODUCONTROL. La tarjeta garantiza el optoaislamiento del controlador respecto a la red serial RS485. La tasa de baudios máxima obtenible es de 38400 baudios (configurable por software).

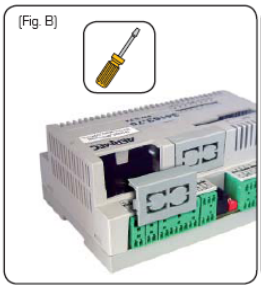
Instalación:

- La tarjeta, una vez extraída del embalaje, se debe instalar en el slot correspondiente de la tarjeta Modu_control (Fig. A);
- Se debe quitar la portezuela usando un destornillador o una herramienta similar (Fig. B);
- Corte los 4 soportes de cierre con una pinza de corte, para abrir la ranura de paso del conector de la expansión (Fig. C);
- En este momento se debe identificar la posición para instalar correctamente la tarjeta. La misma se debe introducir en el conector indicado (Fig. D);
- Después de quitar la conexión extraíble, introduzca la tarjeta MODU_485A con el conector dirigido hacia el exterior, hasta que el bornero haga "click";
- Al finalizar vuelva a cerrar el agujero con la portezuela (Fig. E).

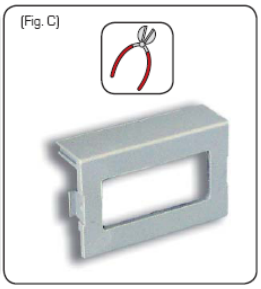
(Fig. A)



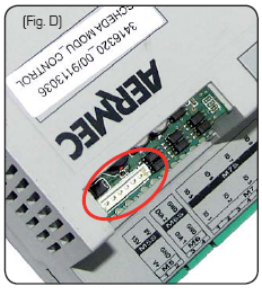
(Fig. B)



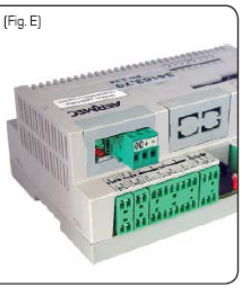
(Fig. C)



(Fig. D)



(Fig. E)



IT Espansione seriale 485:

Collegamenti elettrici:

La connessione alla rete RS485 si ottiene collegandosi al connettore estraibile.
Come cavo è doveroso utilizzare un modello per trasmissione dati a 2 poli + schermo. Collegare lo schermo al polo "GND" e gli altri due conduttori ai poli "+" e "-" del connettore, rispettando ovviamente la polarità dell'impianto RS485.
Caratteristiche del cavo:

- Cavo 2 fili + schermo con coppia intrecciata, sezione max 2.5mm2 (tipicamente AWG20-22).
- La distanza massima del collegamento dipende dalla velocità della trasmissione. Per velocità dell'ordine dei 38400 baud, che è la massima raggiungibile dalla scheda Modu_Control, il cavo non deve superare i 500 metri di lunghezza. Questo valore può aumentare al diminuire della velocità di trasmissione (esempio, velocità di 19200 distanza massima 1km); riferirsi alle caratteristiche della rete per maggiori dettagli.

E' OBBLIGATORIO eseguire i collegamenti a tensione non presente.
Prestare la massima attenzione nel maneggiare la scheda per evitare danneggiamenti dei componenti elettronici dovuti alle scariche elettrostatiche.

EN Serial 485 expansion:

Electric connections:

The connection to the RS485 network is obtained by connection to the extractable connector.
A cable model for data transmission with 2 poles + shield must be used. Connect the shield to the "GND" pole and the other two wires to the "+" and "-" poles of the connector, obviously respecting the polarity of the RS485 plant.
Cable features:

- Cable with 2 wires + shield with twisted pair cable, max. section 2.5mm2 (typically AWG20-22).
- The maximum connection distance depends on the speed of transmission. For speed in the order of 38400 baud, which is the maximum that can be reached by the Modu_Control board, the cable must not exceed 500 metres in length. This value can increase on decrease of the transmission speed (e.g. speed of 19200 maximum distance 1km); refer to the features of the network for more details.

IT IS MANDATORY to make the connections when there is no voltage present.
Pay maximum attention when handling the board in order to prevent damage to the electronic components due to electrostatic discharges.

FR Extension série 485:

Branchements électriques:

La connexion au réseau RS485 s'obtient en se connectant au connecteur amovible. Comme câble, il faut utiliser un modèle adapté à la transmission de données de 2 pôles + blindage. Raccorder le blindage au pôle "GND" et les deux autres conducteurs aux pôles "+" et "-" du connecteur, en respectant évidemment la polarité de l'installation RS485.
Caractéristiques du câble:

- Câbles 2 fils + blindage avec paire torsadée, section max 2,5mm2 (type AWG20-22).
- La distance maximale du raccordement dépend de la vitesse de la transmission. Pour une vitesse de l'ordre de 38400 baud, qui est la vitesse maximale que l'on peut obtenir de la carte Modu_Control, le câble ne doit pas dépasser les 500 mètres de long. Cette valeur peut augmenter si la vitesse de transmission diminue (exemple, vitesse de 19200, distance maximale de 1 km); se référer aux caractéristiques du réseau pour plus de détails.

IL EST OBLIGATOIRE d'effectuer les branchements en l'absence de tension.
Faire très attention au cours de la manipulation de la carte pour éviter d'endommager les composants électroniques suite à des décharges électrostatiques.

DE Serielle 485-Erweiterung:

Elektrische Anschlüsse:

Der Anschluss an das RS485-Netzwerk erfolgt mit dem herausziehbaren Steckverbinder. Als Kabel sollte ein geschirmtes, 2-adriges Modell für Datenübertragung verwendet werden. Abschirmung mit der Klemme "GND" verbinden, die anderen beiden Leiter mit den Klemmen "+" und "-" des Steckverbinders, dabei ist natürlich die Polung der RS485-Anlage zu beachten.
Eigenschaften des Kabels:

- 2-adriges, geschirmtes Twisted-Pair-Kabel mit max. 2,5 mm2 Querschnitt (typischerweise AWG20-22).
- Der maximale Abstand der Verbindung hängt von der Übertragungsgeschwindigkeit ab. Für Geschwindigkeiten der Größenordnung von 38400 Baud, die maximal mit der Karte Modu_Control erreicht werden können, darf das Kabel nicht länger als 500 Meter sein. Dieser Wert kann bei Verringerung der Übertragungsgeschwindigkeit erhöht werden (z. B. Geschwindigkeit 19200 Baud - Maximalabstand 1 km); weitere Einzelheiten sind den Eigenschaften des Netzwerks zu entnehmen.

Das Herstellen der Verbindungen MUSS bei ausgeschalteter Spannung erfolgen.
Karte sehr vorsichtig behandeln, um Beschädigungen der elektronischen Bauteile durch elektrostatische Entladungen zu vermeiden.

ES Expansión serial 485:

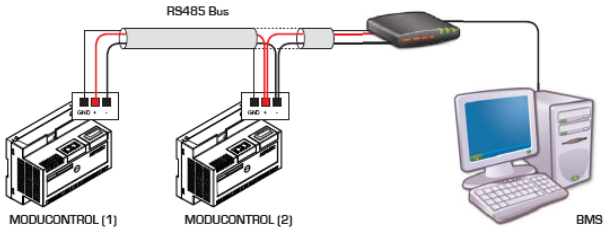
Conexiones eléctricas:

La conexión a la red RS485 se obtiene conectándose al conector extraíble.
Se debe usar como cable un modelo para la transmisión de datos a 2 polos + pantalla. Conecte la pantalla al polo "GND" y los otros conductores a los polos "+" y "-" del conector, respetando obviamente la polaridad de la instalación RS485.
Características del cable:

- Cable de dos hilos + pantalla con par trenzado, sección máx. de 2,5 mm2 (típicamente AWG20-22).
- La distancia máxima de la conexión depende de la velocidad de la transmisión. Para una velocidad del orden de los 38400 baudios, que es la máxima que la tarjeta Modu_Control puede alcanzar, el cable no debe superar los 500 metros de longitud. Este valor puede aumentar si disminuye la velocidad de transmisión (por ejemplo, velocidad de 19200, distancia máxima de 1 km); para más detalles consulte las características de la red.

ES OBLIGATORIO realizar las conexiones sin presencia de tensión.
Preste la máxima atención cuando maneje la tarjeta, para evitar dañar los componentes electrónicos con descargas electrostáticas.

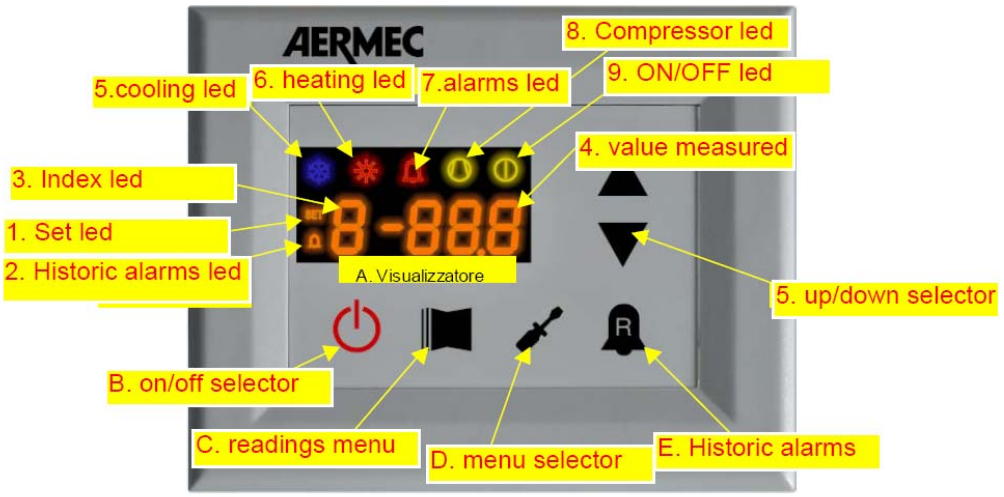
Eseguire il collegamento a tipologia BUS come nel disegno:
Make the BUS type connection as in the diagram:
Effectuer le raccordement de type BUS comme indiqué sur le dessin:
BUS-Verbindung gemäß Zeichnung vornehmen:
Realice la conexión a tipología BUS, como se muestra en el dibujo:

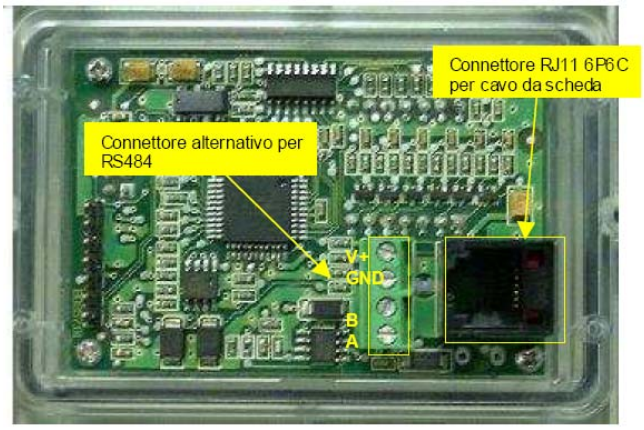


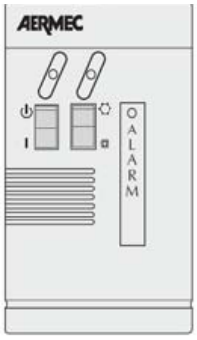
Meaning of modu485A led: red / green flashing connection ok, leds off or on wrong connections

3: USER INTERFACE

The main user interface is rappresented by a LED with capacitive keyboard (touch key). The visualisations are organised via a menù hierarchy that can be activated by pressing the relative button key (see below page). The default in the visualisation of these menus is represented by the probe readings menu. During normal operational mode, the display shows the temperature of the outlet water; of the 4 figures seen on the display, only the three to the right indicate the value of the parameter visualised, while the figure on the left indicates the index with which it is possible to identify the parameter itself (see tables next pages).
You can navigate between the various parameters by using the arrows keys on the right-hand side of the panel; These keys are also used to modify the selected parameters, according to the procedure showed below.







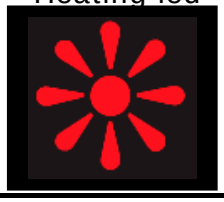
PR3

Simplified remote panel, follows the base controls that can be operated remotely from up to 150 mt.

Pic 6 –User interface

USER INTERFACE		
A	Display	Shows the menus, the parameters and indicates through the LEDs the staus of the unit
B	ON/OFF key	To switch ON/OFF the unit. Pressing for 3 sec to stop the functioning.
C	Probe readings	Button key to access probe readings menu (temperatures pressures and parameters about status of the unit)
D	Set menùs	Button to access the menùs insering the password: **User Menù (password 000)** **Resistance Menù (password 1**) **Installer Menù (password 30)** **2nd Menù Installer (password 31)** **Maintenance Menù (password 83)** **Manufacturer Menù (password 125)** **Compressor and pump (password 72)** **ANR start up procedure (password 333)** **Second readings menù (password 10)** **Manual defrost test (pass 647, par.0=285)**
E	Alarms record	Summary of alarms and pre-alarms codes starting from more recent
F	Arrows key	Keys to scroll increase(UP) or decrease (DOWN) parameters list

Table 3 – Functions of panel

Display		
1	Led set	**Settings menù currently visualised** **Led set fixed** it is showing the USER MENU SET values *or RESISTANCE MENU SET* **Led set blinking** it is showing the MAINTENACE MENU SET values **Led set fixed + alarms record led blinking** it is showing MANUFACTURER MENU SET or COMPRESSOR/PUMP values
2	Alarms record led	**Alarms record Led fixed** it is showing the ALARMS RECORD. **Alarms record Led blinking** it is activated the algorithm for low water volume and for that reason the compressor is in stand by **Can be also that CP is OFF because we are out of FORCE OFF dynamic limit** When **Alarms record and set Leds are OFF** the READINGS MENU is showing
3	parameter index	Shows the parameter inside the menù visualised from leds.
4	parameter value	Shows the parameter value
5	Cooling LED'	**Cooling Led fixed** the unit is setting in cooling mode from user parameter and the digital input C/F is opened. **Cooling Led blinking** the unit is in stand by but is working in frost protection mode activating pump and antifreeze heaters. **Cooling Led blinking + heating Led fixed** the defrost cycle is activated or the unit is doing hot gas injections
6	Heating led 	**Heating Led fixed** the unit is setting in heating mode from user parameter and the digital input C/F is closed.

7	alarm led	**Alarm Led fixed** The unit is OFF by alarm. Must be switch off and then switch on to reset the alarm. **Alarm Led blinking** The unit is OFF by pre-alarm (cp OFF). The unit will automactely re-start when the pre alarm condition will be desappear
8	Compressor led	**Compressor Led fixed** Compressor is ON. **Compressor Led with short blinking** Delay time to start the compressor (min stop time or time between two start up) **Compressor Led with long blinking** Compressor is working and it's waiting the min working time to stop
9	Led ON/OFF	**Led ON/OFF switch on** Unit activated to produce cooling or heating water.

Table 4 – Functions of panel

4.0 READINGS MENU

These parameters are available if microswitches are right configurated.

N	Abbrev.	Name	Function
0	t u A	Outlet water temperature	Temperature (°C) read by NTC 10k probe SUW in the evaporator outlet.
1	t i A	Inlet water temperature	Temperature (°C) read by NTC 10k probe SUW in the evaporator outlet.
2	t S b	Coil temperature	Temperature (°C) read by NTC 10k probe SS in the condenser coil. It used like defrost probe.
3	t G P	Discharge gas temperature	Temperature (°C) read by NTC 3.3k probe SGP in the discharge gas pipe.
4	t A E	Air external temperature	Temperature (°C) read by NTC 10k probe SAE.
5	A P	High pressure	Pressure (relative bar) read by HP trasducer connected to the compressor discharge.
6	b P	Low pressure	Pressure (relative bar) read by LP trasducer connected to the compressor suction
7	t E r	Temperature error	It is a % addition between proportional error and integral error. When this value arrive to differential band (100) the compressor starts. When value zero the compressor stops.
8	S A b	Force off safety band	If the algorithm to control the low water volume (par. 5.3) activated the value is the water temperature when the compressor restarts.
9	C P	Compressors timing	This visualization shows the count down to start/stop the compressor
A	H C 0	Operation time (in thousand)	This visualization shows the times of compressor' operation
b	H C 0	Operation time (unit)	This visualization shows the times of compressor operation
C	S P 0	Started (in thousand)	This visualization shows the numbers of compressor started
d	S P 0	Started (in unit)	This visualization shows the numbers of compressor started
E	r E L	Release	This visualization shows the software version

F	b L d	Build	Software Sub-version.
G	S E t	Actual SET	Actual set point (in case compensation set point activated shows the set point calculated)
H	d C P	Set DCP	Fan speed control set point
I	d C P	Band DCP	Differential band for fan speed control
J	H C 1	Compressors timing 2nd cp	This visualization shows the time that misses to the start or to the turning off the 2nd compressor
L	H C 1	Operation time (in thousand) of 2nd CP	This visualization shows the times of 2nd compressor' operation
M	S P 1	Operation time (unit)of 2nd CP	This visualization shows the times of 2nd compressor operation
O	S P 1	Started (in thousand) of 2nd CP	This visualization shows the numbers of 2nd compressor started
P	P o	Fraction power	It indicates the real capacity that unit gives. In case we have INVERTER UNIT it showed the actual frequency of compressor
Q	r F Q	Frequency demand to Inverter	The frequency that regulator is asking to Inverter board.
r	F r F	Delta LP pressure	On the heat pump units is the delta low pressure after to have fixed the pressure in the defrost logic.

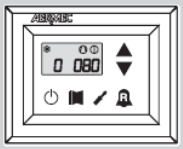
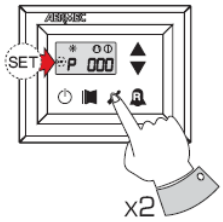
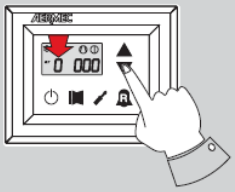
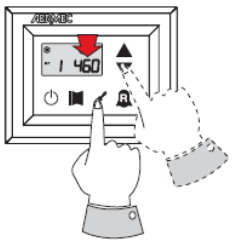
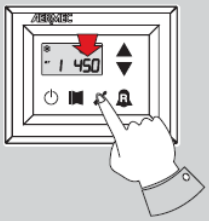
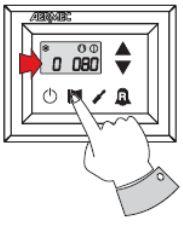
Table 5 – modification Set

SECOND READINGS MENU (Password 10)

N	Description	Name	Value red	tollerance	Meant
0	C o r	Inverter current (A)			Current measured (in Amps) from inverter modul. Parameter showed only with inverter APY
1	U o	Output inverter voltage (V)			Voltage measured (in Volt) from inverter modul. Parameter showed only with inverter APY
2	U o b	Voltage of bus	535 vdc	10%	Bus voltage measured (in Volt) from inverter modul. Parameter showed only with inverter APY
3	HSt	**Inverter Dissipator temperature**			HSt: **Inverter dissipator temperature (in C°). This parameter appears only with inverter APY see set_compressor 2(0)**
4	dFo	**ForceOff dynamic value**			dFo: **Actual ForceOff dynamic value calculated according to the external air temperature.**
5	dHt	**Remote DHW probe value**			**Remote probe mounted inside installation water tank. Enable by par.(0) menu passw 030**

5.0 MODIFICATION OF OPERATIONAL PARAMETERS

To modify previously displayed parameters, you must pass from the default mode (SENSOR READINGS) to the parameter setting and modification mode (SET MENU); to be able to access this menu it is sufficient to press the screwdriver-shaped key present in the central part of the panel; once this key is depressed, an image will appear on the display asking for a password to access the USER settings menu. The password is 000, in other words, you must simply press the screwdriver key in order to access the parameter-setting (MENU SET). To go from one parameter to another, you must use the arrow keys located on the right-hand side of the panel (figure on p. 4), once you have entered into the set menu, all of the parameters discussed in the previous mage will be displayed, with a value for every set parameter; to change it, simply follow the procedure laid out in the following table:

Image	Procedure to use	MENU level
	In the default setting, the only operation enabled is the display of the parameters listed on p. 5, to run through these parameters you must press the up arrow, or the down arrow.	DEFAULT Menu No display on the left side of the parameter index
	To access the SET modification menu, you must press the screwdriver button twice; actually, after pressing it once you will be asked for a password whose code is 000, that is, the default's, therefore simply press the screwdriver key again to confirm the 000 value and to access the SET menu; please remember that if the default value is not 000, this value can be increased or decreased using the arrow keys.	SET Menu (Visualisation) The word SET appears on the left side of the parameter index
	Once you have entered the SET menu, pressing the arrow keys allows you to run through the parameters contained within; as indicated in the previous page, each parameter has an index which indicates which value was set for the specific parameter displayed.	SET Menu (Visualization) The word SET appears on the left-hand side of the parameter index
	To modify a parameter, you must first display it, then simply push the screwdriver key to enter into the MODIFY mode, once the key is pressed, each time an arrow key is pressed the displayed parameter value will increase or decrease.	SET Menu (MODIFY) The word SET appears on the left side of the parameter index
	Once the desired parameter's value is changed, you can save the change you have just made by pressing the screwdriver key again; thereafter, every time an arrow key is pressed, you will not be modifying the parameter's value, but you will be advance the display to the next parameter.	SET Menu (MODIFY) The word SET appears on the left side of the parameter index
	Once you have completed the desired parameter modifications, you will be able to return to the default mode by pressing the sensor value reading key (this key is positioned to the left of the screwdriver key). Please remember that once you have exited the SET menu, to go back to modify the parameter values you must start the procedure described in this table from the beginning.	DEFAULT Menu Nothing appears on the left-hand side of the parameter index

5.1 SETTING OF USER MENU

Pressing the key screwdriver the password is required, to insert the code **000** and pressing the key screwdriver again to confirm and access to the menu USER

N	Description	Name	Min	Default	Max	Meant
0	StA	Season	**0**	**0**	**1**	If is setted 0 the chiller works in cooling mode If is setted 1 the chiller works in heating mode **Since version 3.75 changing it the unit changes status automactely (old versions it was necessary before stop the unit)**
1	StF	Cooling set (°C)	**-20.0**	**7.0**	**26.0**	Set temperature in cooling mode
2	bnF	Cooling temperature band (°C)	**1.0**	**5.0**	**20.0**	Temperature band in cooling mode
3	StC	Heating set (°C)	**15.0**	**45.0** **63 SRP**	**55.0** **Par(t)** **PSW=30 ***	Temperature set in heating mode ***The limit can be aduste from parameter(t) menu PSW=30** **The max limit becomes 70° if parameter(8) =4 to be able to use boiler**
4	bnC	Heating temperature band (°C)	**1.0**	**5.0**	**20.0**	Temperature band in heating mode
5	CSt	Correction Set	**0**	**0**	**3**	Compensation set point on the base of the external temperature: **0.** No correction on the set **1.** Correction on the set in cooling way **2.** Correction on the set in the heating way **3.** Correction on the cooling and heating sets
6	SF1	Cold set 1 (°C)	**- 20.0**	**12.0**	**26.0**	***Visible only with active correction set.*** Set cold 1 correspondent to the parameter temperature **7**

7	t F 1	Temperature external air 1 (°C)	**- 40.0**	**18.0**	**50.0**	***Visible only with active correction set.*** Temperature external air 1 correspondent to the parameter set **6**
8	S F 2	Cold set 2 (°C)	**- 20.0**	**7.0**	**26.0**	***Visible only with active correction set.*** Set cold 2 correspondent to the parameter temperature **9**
9	t F 2	Temperature external air 2 (°C)	**- 40.0**	**30.0**	**50.0**	***Visible only with active correction set.*** Temperature ext. air 1 correspondent to the parameter set **8**
A	S C 1	Heating Set 1 (°C)	**25.0**	**45.0**	**65.0** **Par(t)** **PSW=30 ***	***Visible only with active correction set.*** Set heating 1 correspondent to the parameter temperature **b** ***The limit can be aduste from parameter(t) menu PSW=30 The max limit becomes 70° if parameter(8) =4 to be able to use boiler**
b	t C 1	Temperature external air 1 (°C)	**-40.0**	**0**	**50.0**	***Visible only with active correction set.*** Temperature ext. air 1 correspondent to the parameter set **A**
C	S C 2	Heating Set 2 (°C)	**25.0**	**35.0**	**65.0** **Par(t)** **PSW=30 ***	***Visible only with active correction set.*** Set heating 2 correspondent to the parameter temperature **d** ***The limit can be aduste from parameter(t) menu PSW=30 The max limit becomes 70° if parameter(8) =4 to be able to use boiler**
d	t C 2	Temperature external air 2 (°C)	**-40.0**	**18.0**	**50.0**	***Visible only with active correction set.*** Temperature ext. air 2 correspondent to the parameter set **C**
E	S A S	Domestic water Set point (°C)	**25.0**	**50.0**	**65.0** **Par(t)** **PSW=30 ***	Set point of the domestic water ECS. ***The limit can be aduste from parameter(t) menu PSW=30 The max limit becomes 70° if parameter(8) =4 to be able to use boiler**
F	b A S	Diffrential band of ECS (°C)	**1.0**	**10.0**	**20.0**	Differential band of domestic water set point

5.2 RESISTANCE MENU PARAMETERS

Pressing the key screwdriver the password is required, to insert the code **001** and pressing the key screwdriver again to confirm and access to the menu RESISTANCE

N	Description	Name	Min	Default	Max	Meant
0	SrA	Antifreeze resistance ON (°C)	-20.0	4.0	50.0	It indicates the threshold when the antifreeze resistance is activated
1	brA	Diff. antifreeze (°C)	0.3	1.0	10.0	It indicates the threshold differential about antifreeze resistance to be switch off.
2	Sri	Set Integration resistance (°C)	-20.0	3.0	55.0	Differential respect to the compressor set point
3	bri	Band (°C)	0.0	4.0	20.0	Temperature Band of resistance in heating mode.
4	tA1	Air external 1 SET (°C)	-40.0	5.0	50.0	External air temperature to enable the electric heaters in case we have demand (on to the Sri, Off to the Sri+bri)
5	tA2	Air external 2 SET (°C))	-40.0	-30.0 **-20 SRP**	50.0	Under this air temperature only resistances work.
6	bA	Air Band (°C)	0.0	2.0	20.0	Band of air temperatures set point.

5.3 INSTALLER MENU PARAMETERS

Pressing the key screwdriver the password is required, to insert the code **030** and pressing the key screwdriver again to confirm and access to the menu INSTALLER

N	Description	Name	Min	Default	Max	Meant
0	i u	Inlet water	**0**	**0**	**1**	If it is 1, the chiller works with inlet regulation If it is 0, the chiller works with outlet regulation
1	o F F	Cooling force off (°C)	**-25**	**4.0**	**25.0**	Force off limit. Twout minimum that can be produced Adjustable with dip switch n°3
2	o F C	Heating Force off (°C)	**25.0**	**54.0** **58 ANR** **65 SRP**	**70.0**	Force off limit. Twout maximum that can be produced. **ANF=54**
3	S A F	Force off Temp band (°C)	**0.5**	**5.0**	**20.0**	Above this level the compressor can restarts
4	i n t	Integral time (sec)	**0**	**600**	**999**	Integral parameter time
5	d E r	Derivative time (sec)	**0**	**0**	**120**	This time indicates the TWin variation (the same of temp. band value) needed in order to start the compressor.
6	A G	Antifreeze (°C)	**-50**	**3.0**	**20.0**	Antifreeze set is possible change with setting dip switch only (n°3).If dip switch is OFF=default values
7	F r P	Frost protection	**0**	**0**	**4**	**0**: antifreeze heater not present **1**: Antifreeze heater installed and able to work in cooling and heating only with unit ON **2**: Antifreeze heater installed and able to work also in stand by but switching on the water pump **3**: Antifreeze heater actives with unit in stand by without to start the water pump **4**: with Tae<-3° water pump on for 2' every 30' to monitoring the system water T°. **SW3.9**

8	r i n	Resistance integration	**0**	**0** **1 SRP**	**4**	Parameter that indicates the presence resistance in integration. **0.** Integration electric heaters not present **1.** Integration electric heaters activated **(but doesn't work in HDW V.4.1)** **2.** Heater contact to activate external BOILER. **SW3.9** **3.** Integration electric heaters activated to reach set-point in case comp stopped because out of range. **SW4.0. (Only during HDW production SW4.1) NO SRP** **4. to enable this output as Boiler control (in integration too SW4.1)**
9	P A n	Config. panel	**0**	**0**	**3**	**0.** season (Cooling/heating) decided from parameter **0**, ON/OFF function set up from display on the unit. When remote controls are activated only from that the unit is controlled. **1**. ON/OFF from remote contact, season decided from parameter **0**, **2**. ON/OFF from display on the unit, season decided from contact. **3.** ON/OFF from remote contact, season decided from contact. Since version **3.75** the change over can be done without to stop the unit.
A	A S A	Enable Hot Domestic water	**0**	**1**	**1**	From version 3.7 is available on the Heat pumps the function ECS (domestic water) 0. Domestic water OFF. 1. Domestic water ON Closing ID6 the ECS works. The delay cp working times about compressor and defrost time have priority
b	A S P	Domestic water Power required (%)	**0**	**70**	**100**	Percentage of power to produce hot domestic water. On the ANR it means to use 1 cp for the best efficiency during ECS .
C	A A S	In/Out domestic water waiting time (sec)	**0**	**0**	**600**	It allows the establich waiting time for the inversion of the thre way water valve inserted in the ECS system.

d	t r A	Room Thermostat TRA	**0**	**0** **2 SRP**	**3**	The TRA thermostat closing the ID3 stops the operation of compressors and resistances 0. TRA function not activated. Water pump alarm not activated. 1. TRA activated. Opening it compressor and resistance stop to work. 2. TRA activated. Opening it compressor, resistance and pump stop to work. 3. TRA not activated. The water pump alarm is connected on ID3. Use for software version until version 3.6 Working and defrost times have priority on the TRA function.
E	b A F	Enable flow switch bypass	**0**	**0**	**1**	On the units with ECS function during the three way operation it is possible to bypass the flow switch 1 bypass activated according to the time **F**
F	t b F	Time of flow switch bypass (sec)	**0**	**180**	**300**	Bypass time of flow switch during ECS activation. Time enabled from parameter (E).
G	0 A E	Standby from high ambien temp. (sec)	0	45.0	70.0	Over this ambient temp. Unit is OFF (are switched off pump and compressor). Isteresys 4°C. **SW3.9**
H	A t 1	High inlet water T°	40.0	65.0	80.0	Over this inlet water t° is switch off the water pump and created a pre-alarm. After 15' the pump re-start. At the 3° attemps the unit enter in alarm status. It is actived also with pump off and chile in stand by (alarm comes immediately). The prealarm is at auto reset. **SW3.9**
1	S C r	Screensaver	0	1 **0 SRP**	2	Screensaver function: 0. Screensaver not enable 1. Screensaver on having software version before 1.3 version. It is showed all minus 2. Screensaver on having software version after 1.3 version. Display shows nothing. **SW3.9**
J	Ad1	Modbus Supervisor address	1	1	999	Supervisor address to comunicate with moducontrol. **SW4.0** **E5 control address 200**
L	Bd1	Bauderate Supervisor	0	1	2	Baudrate used by supervisor to communication with moducontrol. **SW4.0**. (8bit date, N-parity, 2 stop bits) 0 – 9600 bps **1 – 19200 bps standard value E5** 2 – 38400 bps

n	AS1	Enable supervisor writing	0	0	1	0 – No writing 1 – Enable writing by supervisor The reading commands are always enabled.**SW4.0** **E5 panel control=1**
o	LA1	Limit air temp. 1	-25.0	-15.0 **-20 SRP**	45.0	External air limit temp. compared with max water temp (parameter(P)) produced by compressor **SW4.0**
P	St1	Limit water temp. 1	0.0	43.0 **62 SRP**	70.0	Max limit of water temp. produced by compressor having air T° < or = parameter (O) **SW4.0**
q	LA2	Limit air temp. 2	-25.0	-10.0 **-10 SRP**	45.0	External air temp. corrisponding of max limit about water temp. (parametro(r)) produced by compressor **SW4.0**
r	St2	Limit water temp. 2	0.0	58.0 **65 SRP**	70.0	Max limit of water temp. produced by compressor having external air T° < or = parameter (q) **SW4.0**
t	LSP	Max. limit heating set point	15	50.0 **63 SRP** **55 ANR**	70.0	Max limit of heating set point admitted for the customer **SW4.0** ***The limit can be adjusted from parameter(t) menu PSW=30** **The max limit becomes 70° if parameter(8) =4 to be able to use boiler (SW4.1)**

Table 1 - Set menù installer

5.31 Second INSTALLER MENÚ password 031

N	Nome	Min	Default	Max	Significato
0	Delta T° To ForceOff dynamic reset (°C)	0.0	6.0	30.0	After CP off by ForceOff dynamic. Parameter(8) = 4 menu passw. = 30. Remote water tank probe present. CP restart if water probe tank T° < ForceOff dynamic T° – this parameter (0 pssw 031) to avoid that CP restart immediately after ForceOff dynamic stop.
1	Heating wire	0	0	2	Heating wire: 0- not present 1- present on output CPA (parameter(0) menu psw=72 “second CP must be 0” 2- present on output VGC in case it isn’t used (dip switch configuration must be: DIP1 = ON, DIP2=ON, DIP5=ON, DIP8=OFF, DIP9=OFF)
2	Set point Heating wire (°C)	-20.0	0.0	10.0	Heating wire ON if external air T°< of this parameter. Heating wire OFF if external air T°> of this parameter + 1°C.

Table 2 - second set menù installer

5.4 MAINTENANCE MENÚ

In order to approach the menu of **MAINTENANCE**, will have to be pressed the key screwdriver, to insert the password **083** by means of the up/down and to still confirm it with the key screwdriver.

N	Description	Min	Default	Max	Meant
0	Tae qualification defrost (°C)	**- 20.0**	**10.0**	**50.0**	It indicates the threshold of external temperature under which the logical ones of defrosting cycle are active (and the control condensation is not enable).
1	T batt. qualification defrost (°C)	**- 20.0**	**4.0**	**50.0**	It indicates the temperature threshold on the air exchanger under which the logical ones of defrosting are active.
2	P delta (bar)	**0.1**	**0.4** **0.3 ANR**	**10.0**	It indicates the fall of suction pressure that enable the defrost after the time setting in the parameter 4.
3	P delta end injection (bar) (Heat pump only)	**0.1**	**0.3**	**10.0**	It indicates the increment of the suction pressure that decrees the end of the gas injection
4	t stable pressure (sec)	**30**	**300** **180 ANR** **600 SRP**	**900**	Second of attended for the stabilization of the pressure after the start of the compressor or the end of an injection for defrosting.
5	t timeout cold water (sec)	**0**	**900**	**999**	In heat pump if the water in escape is inferior to the 30° the defrosting comes inhibited for an interval of equal time to this parameter. If the temperature of the water returns to 30° or the time expires it enabled a defrosting cycle by 4 way valve.
6	t min injection (sec)	**30**	**120**	**900**	Time minimal of injection hot gas.
7	t max injection (sec)	**60**	**300**	**900**	The maximum time of hot gas injection.
8	Max exited for time	**1**	**3**	**20**	After N (=parameter) exited from defrosting for injection caused from timeout the N+1 will be for cycle reversal. Moreover if for N consecutive times the defrosting still happens a smaller interval of the previous one, the defrost will forced for cycle reversal.

9	End defrost temperature 4way valve (°C)	**4.0**	**12.0** **20.0 ANR** **25.0 SRP**	**35.0**	End temperature of defrosting for cycle reversal.
A	Pressure of reversal cycle (bar)	**0.5**	**2.8** **1.3 ANR** **0.8 SRP**	**15.0**	Suction pressure where it forced the defrost cycle using 4 way valve (if the defrosts required).
b	Time minimal reversal of cycle (sec)	**15**	**120**	**900**	Minimal duration of one defrost by cycle reversal.
C	Time maximum reversal of cycle (sec)	**60**	**300** **600 ANR**	**900**	Duration maximum of one defrost by for cycle reversal.
d	The minimal time between reversals of cycle (**min**)	**2**	**20**	**40**	The minimal interval of time that must elapse between two defrosts for cycle reversal
E	Max working time without defrosts via reversal of cycle (min)	**0**	**240** **120 ANR** **180 SRP**	**840**	After this cumulative time of compressor a defrost by reversal cycle is forced.
F	Pressure of set DCP to heat pump (bar)	**20.0**	**35.0** **23 ANR**	**40.0**	Pressure of set considered for the control condensation in heat pump mode
G	Band of pressure DCP to heat pump (bar)	**2.0**	**5.0** **4.0 ANR**	**20.0**	Band of pressure used for the control of condensation to heat pump mode
H	Minimal TAE DCP (°C)	**- 20.0**	**- 5.0**	**32.0**	Minimal temperature used for the calculation of the condensation set point
I	TAE maximum DCP (°C)	**34.0**	**40.0**	**45.0**	Maximum temperature used for the calculation of the condensation set point
J	P set minimal (bar)	**5.0**	**18.0** **12 ANR**	**24.0**	The minimal set of high pressure used for the calculation of the condensation set point
L	P set maximum (bar)	**5.0**	**18.0** **12 ANR**	**38.0**	The maximum set of high pressure used for the calculation of the condensation set point

n	P band min T(bar)	**2.0**	**17.0** **14 ANR**	**20.0**	Minimal band for the control of the condensation set point
o	P band max T (bar)	**2.0**	**12.0** **8 ANR**	**20.0**	The maximum band for the control of the condensation set point
P	Minimal voltage in escape from DCP	**0.1**	**1.5**	**9.0**	Minimum voltage (correspondent to the minimal speed according the value of signal) in escape from the DCP
q	Pressure of control during cycle reversal (bar)	**20.0**	**30.0** **20 ANR**	**45.0**	If the discharge pressure reachs this value during the cycle reversal the fan is actived
r	Diff. pressure of control during cycle reversal (bar)	**5.0**	**5.0** **2.0 ANR**	**20.0**	Threshold differential about parameter to stop the fan during the defrost cycle
t	Pressure limit to defrost by VIC (bar)	**1.0**	**5.5** **3.0 ANR**	**15.0**	If the LP is lower this limit defrosts only by 4 way valve ANLI070/100=10
u	Discharge Temperature limit to defrost by VIC(°C)	**30.0**	**50.0** **75.0 ANR**	**100.0**	If the discharge temperature is lower this limit defrosts only by 4 way valve.
y	Max flow switch pre-alarms	**0**	**0**	**5**	Max flow switch pre alarms before to have FL alarm

table 9 – maintenance menù set

2Th MAINTENANCE MENU

In order to approach the menu of **COMPRESSOR 2**, will have to be pressed the key screwdriver, to insert the password **333** by means of the arrows and to still confirm it with the key screwdriver.

N	Nome	Min	Default	Max	Significato
0	Delta Pressure to activate the 4 way valve VIC (bar)	0.5	1.0	5.0	When the time about parameter(1) is gone, after the cp start up if the delta P>1 bar the 4 way valve is activated
1	Delay time delta P after CP1 On (sec)	0	15	60	When CP1 starts this is a delay time to control the delta P and to decide if activate the 4 way valve
2	Delay time delta P after CP2 On (sec)	0	15	60	If also CP2 starts this is a delay time to control the delta P and to decide if activate the 4 way valve
3	Logic VIC opposite	0	0 1 - SRP	1	Logico f 4 way valve: **0 – normal logic.** Valve without power = cooling functioning. Valve with power = heating functioning. **1 – Opposite logic.** Valve without power = heating functioning. Valve with power = cooling functioning. (SRP logic). **SW3.9**
4	Only HEAT PUMPS units	0	0 1-SRP	1	SRP selection (only heating functioning). Cooling set point and band can't be selected into the user menu.**SW3.9**

IN HEATING:

1. The unit starts for first time from standby or after power voltage reset or after alarms reset. (if unit was stopped by setpoint the control it isn't done because 4 way valve stay supplied)
2. The first compressor starts
3. After 15 sec (parameter 1 of ANR START UP menù password 333) is controlling the difference of pressure between HP and LP and if the delta P > 1 (parameter 0) the 4 way valve is activating and the unit works in normal operation. If the delta P < 1 the controller proceeds with point 4.
4. Starting of second compressor.
5. Dopo 15 sec (parameter 2) password 333 is controlling the difference of pressure between HP and LP and if the delta P > 1 (parameter 0) the 4 way valve is activating and the unit works in normal operation. If the delta P < 1 the unit get on an **alarm code 54** (4 way valve blocked)

IN COOLING:

6. The unit starts for first time from standby or after power voltage reset or after alarms reset (if unit was stopped by setpoint the control it isn't done because 4 way valve isn't supplied)
7. The first compressor starts
8. After 15 sec (parameter 1 of ANR START UP menù password 333) is controlling the difference of pressure between HP and LP and if the delta P > 1 (parameter 0) the 4 way valve is activating and the unit works in normal operation. If the delta P < 1 the controller proceeds with point 4.
9. Starting of second compressor.
10. Dopo 15 sec (parameter 2) password 333 is controlling the difference of pressure between HP and LP and if the delta P > 1 (parameter 0) the 4 way valve is activating and the unit works in normal operation. If the delta P < 1 the unit get on an **alarm code 54** (4 way valve blocked)

From version SW 3.9.0 there is a new deltaP control also on inverter chiller. This control is done:

#	Step
1	Start up from standby or after a power supply reset or alarm. When unit is in temperature at the cp start up no control because VIC is always under voltage.
2	Cp start up if frequency request > minimum frequency (set_compressor(d)).
3	In case min. frequencyis reached set_compressor(d) if it is present a delta P > 1 bar (parameter(0) menu password=333) unit works. If delta P < 1 bar go to step 4.
4	It is forced the start up frequency set_compressor(G). hen this frequency is reached it waits 15" (parameter(2) menu password=333) and it is checke the delta P. If delta P > 1 bar unit work. If delta P < 1 bar an alarm 54 comes and uniti s stopped.

5.5 FACTORY MENU

In order to approach the **FACTORY menù**, screwdriver will have to be pressed, to insert password **125** by up/down buttons and to be still confirmed with screwdriver key.

N	Description	Min	Default	Max	Meant
0	Factory	**0**	**0**	**1**	If is setted 1 all the parameters instantaneously are brought back to the default of factory. Do this operation with unit in stand by
1	Pressure transducers setting	**0**	**0**	**255**	The scale adopted from modu_control shapes the kind (i.e) of the pressure transducers used **IN CASE THE READINGS AREN'T CORRECT TO CHECK THE RIGHT CONFIGURATION SEE PARAGRAPH 4.8 PAGE 43** **ANLI=1**
2	HP differential for emergency injections	**0**	**1.0**	**10.0**	It indicates the threshold differential about the high pressure alarm that enable the emergency injection. If 0 the control is not applied. Example: if this parameter is 2,0 and the alarm of high pressure is 40,0, the active injection to the pressure 40,0 - 2,0 = 38,0 bars
3	LP differential for emergency injections	**0**	**0.5** **0.1 ANR**	**10.0**	It indicates the threshold differential about the low pressure alarm that enable the emergency injection. If 0 the control is not applied. Example: if this parameter is 0,5 and the alarm of low pressure is 2,0, the active injection to pressure 2,0 + 0,5 = 2,5 bars
4	TGP differential for emergency injections (°C)	**0**	**5.0**	**50.0**	It indicates the threshold differential about the discharge gas temperature that enable the emergency injection.
5	Maximum number injections gas of emergency admitted	**0**	**5** **15 ANR**	**100**	Max. number of emergency injections gas admitted with compressor in operation.
6	Discharge gas temp. alarm (°C)	**80.0**	**135.0**	**145.0**	Such discharge temperature stops the compressor by alarm.
7	Diff. Temperature to the alarms reset (°C)	**0.2**	**10.0**	**20.0**	It is the delta temperature to reset an pre-alarm on the temperature TGP. This is not able for the antifreeze alarm where it used the parameter **0**.

8	High pressure alarm (bar)	**30.0**	**40.5** **27 ANR** **30 SRP**	**45.0**	This high pressure value stops the compressor by pre-alarm.
9	Low pressure alarm in cooling (bar)	**0.5**	**4.0** **1 ANR**	**15.0**	This low pressure value stops the compressor by pre-alarm in cooling mode.
A	Low pressure alarm in heating (bar)	**1.0**	**2.0** **0.5 ANR**	**15.0**	This low pressure value stops the compressor by pre-alarm in heating mode.
b	Differential pressure to alarms reset (bar)	**0.5**	**2.0**	**20.0**	Differential pressure that enable the alarms reset.
C	Timeout alarms	**10**	**60**	**900**	When a pre-alarm is activated if for this time the prealarm condition is not resolve the machine enters in state of alarm.
d	Max prealarms	**1**	**5** **10 ANR** **4 SRP**	**20**	The maximum numbers of prealarms before to enter in the alarm condition
E	Decrement alarms (h)	**0**	**1**	**12**	Number of hours after which the counter of prealarms decreases
F	Capacity control	**0.5**	**1.5**	**10.0**	Minimal delta water T° to find to the end of start up (performance control).
G	Capacity control time (sec)	**15**	**150**	**600**	Interval of operating time of the compressor, after that the performance control is done.
H	Antifreeze / low pressure by-pass (sec)	**0**	**180** **240ANR**	**900**	Antifreeze and low pressure time of bypass at the compressor start up and during defrost.
I	Delay time before reversal valve cycle	**0**	**15**	**600**	Interval of time between the stop of the compressor and the reversal cycle entering and exiting from defrosting cycle.
J	Threshold differential of the antifreeze reset	**0.5**	**1.0**	**20.0**	Threshold differential for the antifreeze alarm reset when we have antifreeze threshold + this parameter.

Table 10 – Factory menù

5.6 COMPRESSOR AND WATER PUMP MENU

In order to approach the menu of **COMPRESSOR / PUMP**, will have to be pressed the key screwdriver, to insert the password **072** by means of the arrows and to still confirm it with the key screwdriver.

N	Description	Name	Min	Default	Max	meant
0	C P A	Percentage of ausiliary COMPR (%)	**0**	**0**	**80**	If it is to ZERO the unit is mono-compressor. If we have another value means that we have a tandem compressor and it is indicated the percentage of 2nd compressor . ANL100/150/200=50 ANR502/802=60, ANR902=60
1	0 n	Min working time cp (sec)	**30**	**120**	**900**	Minimum working time for both compressors.
2	0 F F	Minimum OFF time compressor (sec)	**30**	**180**	**900**	Minimum stopping time for both compressors.
3	S P n	Max Start up x hour	**3**	**12**	**30**	Max start up per hour
4	ı n t	Delay time between two compressors start up (sec)	**10**	**30**	**600**	Time between two compressors starts up in case we have tandem. It is forced to the parameter 1 if the volume of water is low.
5	P P C	Time at the first water pum start up	**30**	**150**	**600**	At The first time when the power supplì comes the water pump works for this time in order in case the performance control is activated to allow at the probe sto read same water temperature value **Units with softstarter: increase to 310" in case often voltage power line is lost to permit softstarter automactely reset**
6	F L	Flow switch by pass (sec)	**2**	**5**	**120**	Time that flow switch must be open in case the water pump is working
7	A P P	Flow switch by pass at the pump start up(sec)	**2**	**40**	**360**	Time where the flow switch alarm is by passed at the water pump start up
8	P P	Stopping water pump time (sec)	**10**	**120**	**999**	It is the minimum stopping time of the water pump in case a flow switch pre alarm comes. After that the pump restart automactely
9	P L d	Pulldown (°C)	**0.0**	**1.0**	**10.0**	When the first compressor is working (cool/heat) and the inlet water temp drops down in a minute as or more a parameter setting the 2nd compressor never starts.

A	SSt	Compressor waiting time (sec)	**0**	**0**	**600**	If it is different to zero the minimum compressor off time is forced also in case of defrost. Normally it used in case a soft starter is present.(setting *190)*
b	Fr9	Frequency forced (Hz)	**-1**	**-1**	**360**	It is possible for test, to force the frequency of compressor using this parameter (with value –1 the compressori s controller by controller).
C	HFr	Max. Frequency (Hz)	**10**	**90**	**360**	Max frequency of inverter regulation. ANLI070=62 ANLI100/200=360
d	LFr	Min Frequency (Hz)	**0**	**20**	**120**	Min frequency of inverter regulation. ANLI100=60
E	dFr	Defrost Frequency (Hz)	**10**	**90**	**360**	Fixed frequency used to do both the kind the defrosting. ANLI070=62 ANLI100=360
G	AFr	Exit Frequency (Hz)	**0**	**30**	**120**	Frequency of inverter before a stop or before to do a reversing cycle. ANLI100=60
F	SFr	Start up Frequency (Hz)	**10**	**60**	**120**	Inverter frequency at the compressor start up. After that the frequency modulation starts according water temperatures. ANLI100=240
H	OFr	Oil back frequency (Hz)	**10**	**25**	**120**	Under this frequency value the inverter compressor frequency is monitored
I	td0	Min defrost time for inverter units (min)	**0**	**10**	**120**	Min time between two hot gas injections defrost into the Inverter units. If LP<set maintenance(t) this is the minimum time between two reversing cycle
J	td1	Max defrost time for inverter units (min)	**0**	**45**	**120**	Max time between two hot gas injection defrost into the Inverter units. If LP<set maintenance(t) this is the maximum time between two reversing cycle
L	din	Increasing time between defrosts (min)	**0**	**5**	**120**	Adding time between two defrosts by hot gas in case the last one had success (no stop by max time)
n	tin	Time to activate reversing defrost cycle (min)	**0**	**15**	**120**	Time between the last one defrost using hot gas valve and defrost by 4 way valve
o	10n	Min running time of Inverter (sec)	**30**	**180**	**999**	Min running time of inverter compressor

P	I S t	Min time to inverter start up (sec)	**0**	**5**	**999**	Delay time in second between power supply on the board and first serial signal to inverter start up.
q	S H t	Inverter stopping time (sec)	**0**	**20**	**999**	Time in seconds that inverter compressor must work before to stop.
r	I E C	Inverter status code	**0**	**0**	**255**	The last one information code received from inverter board, it is only a reading.
t	Stt	**Delay time to CP restart after main voltage power shut off**	**0**	**0 EMERSON = 180 GAVAZZI= 60**	**360**	**Used only when SMART STARTER are mounted to prevent when we have fast voltage on/off that smart starters stay activated.**

Table 10 - Configuration compressors and pumps

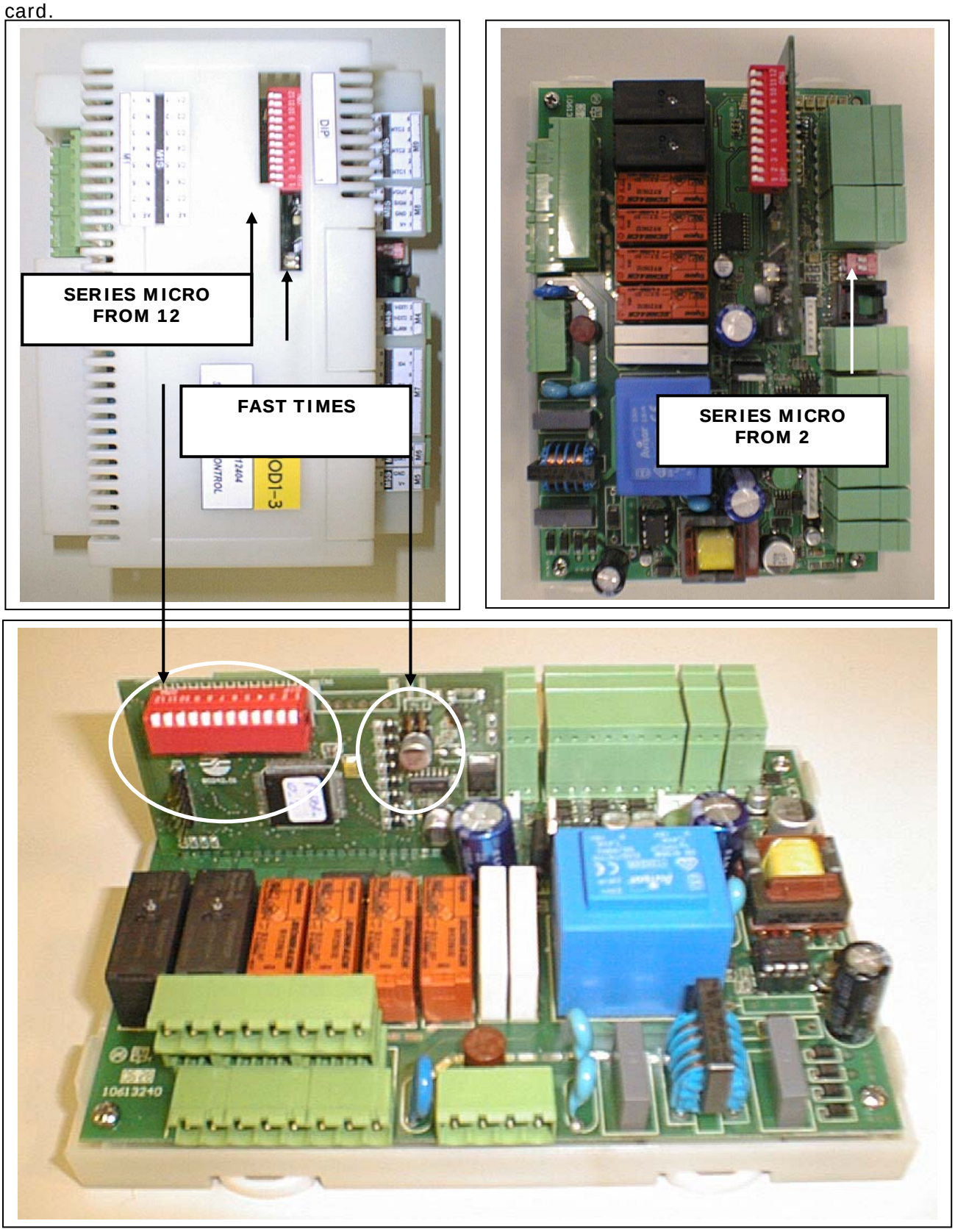
5.7 2nd COMPRESSOR MENU

In order to approach the menu of **COMPRESSOR 2**, will have to be pressed the key screwdriver, to insert the password **073** by means of the arrows and to still confirm it with the key screwdriver.

N	Sigla	Nome	Min	Default	Max	Significato
0	inU	Type of inverter used	0	0 **ANLI100=1**	1	Type of inverter used: 0- Inverter type Longertek 1- Inverter type APY . Having inverter APY the frequencies setted on menu compressor (password 72) are the frequencies generated from inverter modul. The frequencies showed on readings menu parameter(P) e parameter(q) are the frequence (rpm per second) of compressor. These are 1/3 of frquencies generated from inverter modul. **SW3.9**
1	fpr	Partialization Frequence	10	10 **ANLI100=30**	100	In case of partialization is the frequence value that reduces the actual working frequence. (See **0**) **SW3.9**
2	ppr	Partialization Pressure	0	39.9	42.0	It is the HP value over that is activated the partialization.**SW3.9**

6.0 MICROSWITCHES CONFIGURATION

Beyond to the parameters from panel, 12 + 2 microswitches are present on card (see pictures below) that they allow some relative configurations to the machine on which is mounted the card.



Micro	Default	Description
1	**-**	OFF – cooling unit ON – heat pump unit
2	**OFF**	OFF – defrosting by hot gas injection (**fan is off**) ON – defrosting by 4 way valve (ANF)
3	**OFF**	OFF – blocked antifreeze set point ON – glycol water: adjusting antifreeze set point
4	**OFF**	Capacity control OFF – control activated Capacity control ON – control not activated
5	**OFF**	OFF – qualified emergency partialization procedure (**fan is on**) ON – not qualified emergency partialization procedure (ANF)
6	**OFF**	OFF – algorithm control OFF about low water volume ON – algorithm control ON about low water volume
7	**OFF**	OFF – DCPX not present ON – DCPX present
8	**OFF**	OFF – ANL (R410A) ON – ANR ANF R407C
9	**OFF**	OFF – Standard chiller ON/OFF ON – Inverter chiller
10	**OFF**	OFF – Chiller ON – Motocondensing unit
11	**OFF**	Not used
12	**OFF**	Not used

Table 9 – Meant of the 12 microswitches (dip switch)

DIP SWITCHES UNITS CONFIGURATION

Example of meaning:

ANL: Dip1 only H version in ON - Dip2 always OFF - Dip3 only Y and Z version ON…….

ANL: all settings must be done without power supply

DIP N°	VERSION OF UNIT	DESCRIPTION
1	H	ON - heat pumps
2		OFF (ON for France Geothermie)
3	Y - Z	ON – having glycol antifreeze set point can be adjusted
4	A	ON – capacity control not activated
5	ALL except H version	ON – Safety injections not activated
6	A	ON – Algorithm low water content not activated
7	With DCPX	ON – Fan speed controller in operation
8		OFF
9		OFF
10	C	ON – Motocondensing unit
11		Not used
12		Not used

DIP N°	VERSION OF UNIT	DESCRIPTION
1	All	OFF – the LP trasducer is ratiometric (signal 0 -4.5 Vdc)
2	All	OFF – the HP trasducer is ratiometric (signal 0 - 4.5 Vdc)

ANR: all settings must be done without power supply

DIP N°	VERSION OF UNIT	DESCRIPTION
1	H	ON - heat pumps
2		OFF
3		OFF
4	A - K	ON – capacity control not activated
5	ALL except H version	ON – Safety injections not activated
6	A - K	ON – Algorithm low water content not activated
7	With DCPX	ON – Fan speed controller in operation
8	ALL	ON – ANR (R407C)
9		OFF
10		OFF
11		Not used
12		Not used

DIP N°	VERSION OF UNIT	DESCRIPTION
1	All	OFF – the LP trasducer is ratiometric (signal 0 -4.5 Vdc)
2	All	OFF – the HP trasducer is ratiometric (signal 0 -4.5 Vdc)

ANF: all settings must be done without power supply

DIP N°	VERSION OF UNIT	DESCRIPTION
1	H	ON - heat pumps
2	ALL	ON – Defrost only by 4 way valve
3		OFF
4	A – K	ON – capacity control not activated
5	ALL	ON – Safety injections not activated
6	A - K	ON – Algorithm low water content not activated
7	With DCPX	ON – Only version without buffer tank fan speed controller is installed OFF – Only version with buffer tank, A – K . Dcpx absent
8	ALL	ON – ANF (R407C)
9		OFF
10		OFF
11		Not used
12		Not used

DIP N°	VERSION OF UNIT	DESCRIPTION
1	All	OFF – the LP trasducer is ratiometric (signal 0 -4.5 Vdc)
2	All	OFF – the HP trasducer is ratiometric (signal 0 -4.5 Vdc)

ANLI: all settings must be done without power supply

DIP N°	VERSION OF UNIT	DESCRIPTION
1	H	ON - heat pumps
2		OFF
3		OFF
4		OFF
5	ALL except H version	ON – Safety injections not activated
6		OFF
7	With DCPX	ON – Fan speed controller in operation
8		OFF
9	ALL	ON
10		OFF
11		Not used
12		Not used

DIP N°	VERSION OF UNIT	DESCRIPTION
1	All	ON – the LP trasducer is piezoelectric (signal 4 - 20mA)
2	All	OFF – the HP trasducer is ratiometric (signal 0 - 4.5 Vdc)

SRP: all settings must be done without power supply

DIP N°	VERSION OF UNIT	DESCRIPTION
1	ALL	ON - heat pumps
2	ALL	ON – only defrosts by 4 way valve
3	ALL	OFF – having ON glycol antifreeze set point can be adjusted
4	ALL	ON – capacity control not activated
5	ALL	ON – Safety injections not activated
6	ALL	OFF – Algorithm low water content not activated
7	ALL	OFF – Fan speed controller
8	ALL	ON – R407C
9	ALL	OFF
10	ALL	OFF
11		Not used
12		Not used

DIP N°	VERSION OF UNIT	DESCRIPTION
1	ALL	OFF – no trasducer
2	ALL	OFF – the HP trasducer is ratiometric (signal 0 - 4.5 Vdc)

Microswitches pressure trasducers setting

1	OFF	OFF – the LP trasducer is ratiometric (send back a voltage signal from 0.5 V to 4.5 V) ON – the LP trasducer is piezoelectric (send back a current signal from 4 mA to 20 mA)
2	OFF	OFF – The HP trasducer is ratiometric (send back a voltage signal from 0.5 V to 4.5 V) ON – The HP trasducer is piezoelectric (send back a current signal from 4 mA to 20 mA)

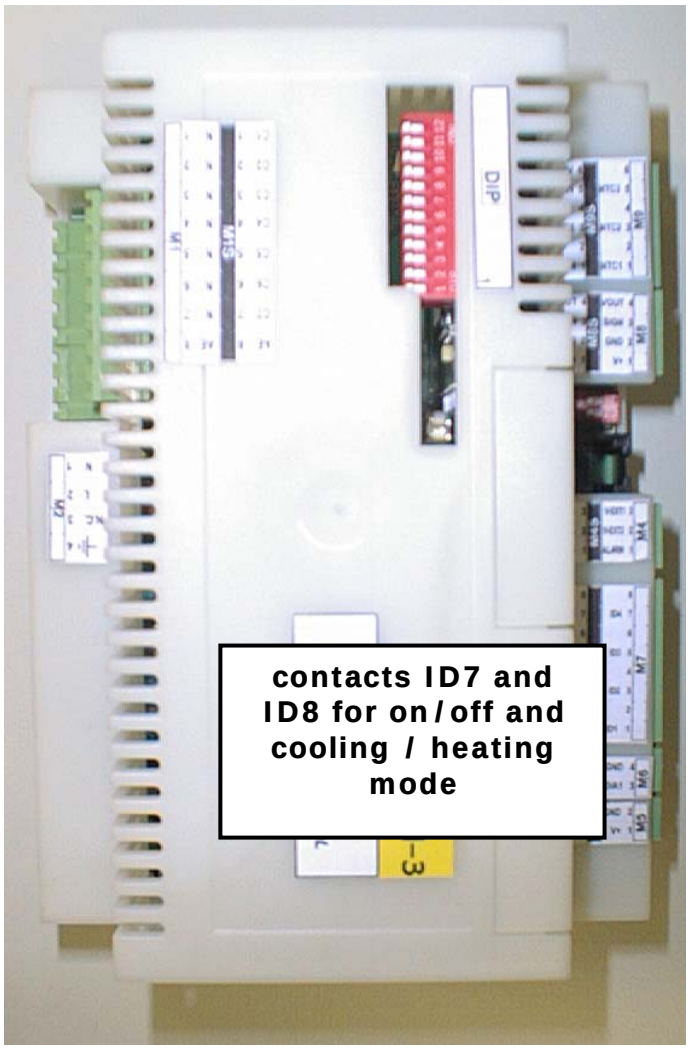
Table 12 – Meant of trasducers dip switches configuration

Factory Set(1)	**Meant**
0 (default)	HP and LP trasducers type “ratiometric” (0 –50 bar) ***dip1 = OFF dip2 = OFF***
1	HP trasducer raziometrico (0 –50 bar), LP trasducer piezoelectric (0 –18 bar) ***dip1 = ON dip2 = OFF***
2	HP trasducer ratiometric (0 –50 bar),LP trasducer piezoelectric (0 –7 bar) ***dip1 = ON dip2 = OFF***
3	HP trasducer ratiometric (0 –50 bar), LP trasducer piezoelectric (0 – 46 bar) Dip1 = ON dip2 = OFF
…	Like default
16	HP trasducer piezoelectric (0 – 46 bar) LP trasducer raziometric (0 –50 bar) ***dip1 = ON dip2 = ON***
17	HP trasducer piezoelectric (0 – 46 bar), LP trasducer piezoelectric (0 –18 bar) ***dip1 = ON dip2 = ON***
18	HP trasducer piezoelectric (0 – 46 bar), LP trasducer piezoelectric (0 – 7 bar) ***dip1 = ON dip2 = ON***
19	HP trasducer piezoelectric (0 – 46 bar), LP trasducer piezoelectric (0 – 46 bar) ***dip1 = ON dip2 = ON***
…	Like default

Table 13 – Meant of trasducers dip switches configuration

7 ON/OFF CONTACT AND FUNCTIONING MODE

On the card contacts ID7 and ID8 are present. They are only used like switch ON/OFF and season contact (effective if the machine is shaped like heat pump), **is qualified only if the parameter (p) on the set-installer is different from zero**, otherwise the contacts are not enable.



contacts ID7 and ID8 for on/off and cooling / heating mode

set_installer 9 (p) = 1 or 3:

Closing contact **ID7** the unit starts.
Opening contact **ID7** the unit

set_installer (p) = 2 or 3:
With the unit in heat pump mode, in order to execute the change season before it **must switch off from on/off.**
Closing **contact ID8** the unit is forced in heating.
Opening **ID8**, it is the parameter **set_user (0)** that decides the functioning
0 unit works in cooling

1 unit works in heating

Contact **ID 8** has the priority on the change season from panel to start/stop the unit. (cannot be forced the cooling if from remote they are in heating).

9	P A N	Config. panel	**0**	**0**	**3**	**0.** season (Cooling/heating) decided from parameter **0**, ON/OFF function set up from display on the unit **1**. ON/OFF from remote contact, season decided from parameter **0**, **2**. ON/OFF from display on the unit, season decided from contact. **3.** ON/OFF from remote contact, season decided from contact. **Since version 3.75 the cool/heat can be done without stop the cp.**

8 REGULATION

The regulation logic that decides the operation of new series ANL are constituted from three overlapping algorithms.

1/THERMOSTAT: this algorithm has the task to maintain the temperature of the water in inlet/outlet the most possible close to the set point decided from the customer, using the inlet or outlet regulation.

- Parameter for inlet – outlet regulation on the set_installer (0).
- Parameter cooling set point on the set_user (1).
- Parameter heating set point on the set user (3).

The outlet regulation is a default setting and uses the proportional + integral logic water temp. control: the proporzional error is the distance of the outlet temperature from the set point, while the integral error is the relationship between the integral considered in a time **ti**

- Parameter integral set set-installer (4).

The inlet regulation uses the proportional control like default and optionally the derivative control: the proporzional is constituted from the distance of the inlet temperature from the set point, while the derivative is constituted from the product of the medium variation of the water temperature in 5s (time of sampling).

- Parameter set derivativ set installer (5).

2/TIMES COMPRESSOR CONTROL: this algorithm controls that are respects the minimal time when the compressor is switch off, the minimal operation time of the compressor and the max number of start per hour.

- Parameter the minimal time off set_comp/pump (2)
- Parameter the minimal time on set comp/pump (1)
- Parameter set max starts number set_comp/pump (3)

3/LOW CONTAINED (volume) OF WATER (OPTIONAL): this algorithm comes qualified from dip switch and has the task to maintain the outlet water temperature over the threshold of “force off” respecting the compressor times.

- Parameters set force off in cooling set_installer (1)
- Parameters set force off in heating set_installer (2)

To the regulation logic cooperate also the fan speed control DCPX and defrost logic to increase the performances and efficiency of unts

Thermostat water control

The inlet/outlet water temperature is controlled with a proportional algorithm control and plus an integral logic control only for the outlet water regulation.
There is also an option for the derivative control only for inlet water regulation application.
The parameters able to do these regulations are:
proportional differential **D** (*set_user(1)* in cooling; *set_user(3)* in heating; integral time $\mathbf{t_i}$ (*set_installer(4),* and when it is zero the integral control is bypassed; variation time $\mathbf{\Delta t_{var}}$ (*set_installer(5),* and when it is zero the derivative control is bypassed.
The thermostat is able to start the compressor using an addition between proportionale+integral error for the outlet water regulation and proprotional+derivative (option) for the inlet water control

Legenda:

TIA(t): istantaneous inlet temp

TUA(t): istantaneous outlet temp

D*: proportional band, (set_user(2) in cooling, set_user(4) in heating*

SET*: set point, (set_user(1) in cooling, set_user(3) in heating*

EI(t): integral error value
ED(t): derivative error value
$\mathbf{EP_{out}(t)}$: proporzional error value in the outlet
$\mathbf{EP_{in}(t)}$: proporzional error value in the inlet
$\mathbf{t_i}$: integrazion time, (*set_installer(4)*)
dt: testing time (5 sec)
$\mathbf{\Delta t_{var}}$: variazion time (*set_ installer (5)*)

The error function formul for the outlet water is:

$$Err(t)\ (°C) = EP_{out}(t) + EI(t)$$

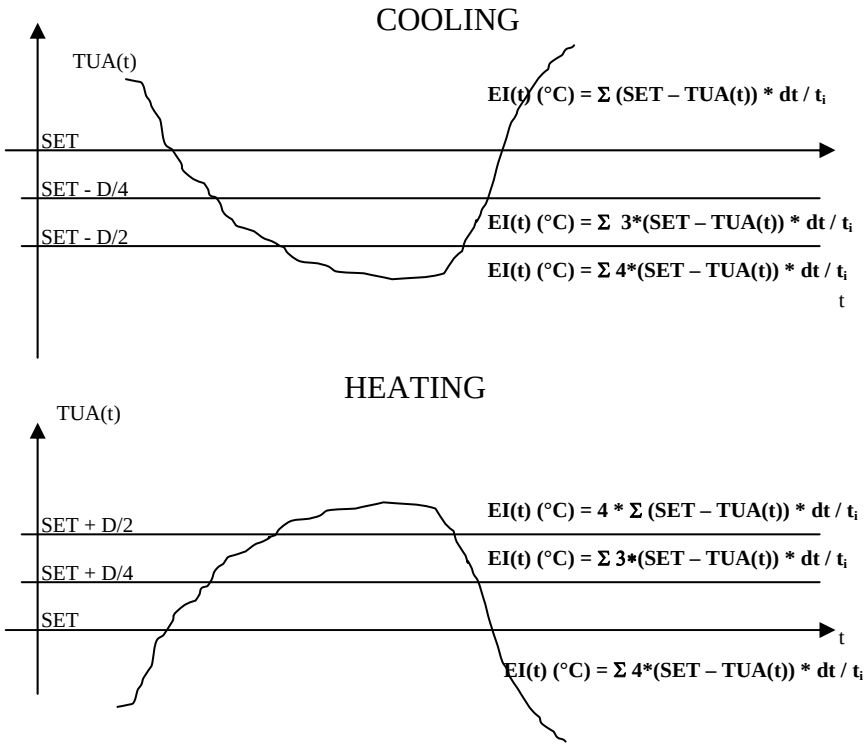
where:

$$EP_{out}(t)\ (°C) = SET - TUA(t)$$

and

$$\mathbf{EI(t)\ (°C) = \Sigma\ (SET - TUA(t))\ *\ dt\ /\ t_i}$$
$$(\text{having } \Sigma\ (SET - TUA(t))*dT <= D * t_i)$$

Σ (SET - TUA(t)) is the actual addition updated every 5 seconds of value (SET - TUA(t)).
For default t_i = 600 sec. The integrali t isn't simmetric on the SET.
When the set point is reached the sum total is multiplyed for a factor 3 or 4 (see picture 9).


COOLING
TUA(t)
EI(t) (°C) = Σ (SET – TUA(t)) * dt / ti
SET
SET - D/4
SET - D/2
EI(t) (°C) = Σ 3*(SET – TUA(t)) * dt / ti
EI(t) (°C) = Σ 4*(SET – TUA(t)) * dt / ti
t
HEATING
TUA(t)
EI(t) (°C) = 4 * Σ (SET – TUA(t)) * dt / ti
SET + D/2
EI(t) (°C) = Σ 3*(SET – TUA(t)) * dt / ti
SET + D/4
SET
t
EI(t) (°C) = Σ 4*(SET – TUA(t)) * dt / ti

Pic 9 : Integral correction

In cooling (*set_user(0) = 0*) the cp starts when **Err (°C) < -D** (*set_user(1)*) and it stopped when **Err = 0**.
In heating (*set_user(0) = 0*) it starts when **Err > D**.
ERR can be read on book menu parameter 7.

Always the compressor stops if it arrives to force off limit (cooling *set_ installar (1)* 4°C of default, hetaing *set_ installer (2)* 54 °C of default). Can restart if in case there is demand when force off + security band *set_ installer(3)* in cooling, force off – security band *set_ installer (3) in heating*.
Never forget that the waiting times of compressor and the algorithm about low water volume have priority on the compressor start up in case we have demand from the system.

Inlet control (*set_ installer (0) = 1*)

The error function for the inlet water control is:

Err(t) (°C) = EP_{in} (t) + ED(t)

where:

EP_{in}(t) (°C) = SET - TIA(t)

and

ED(t) (°C) = (TUA(t) – TUA(t-dt) * Δt_{var}) / dt

(having TUA(t) – TUA(t-dt) * Δt_{var} <= D * dt)

Default factory setting Δt_{var} = 0 (derivative control not enabled).

Aermec advises value > of 60 seconds

*In cooling (set_user(0) = 0) the compressor starts when **Err (°C)** < **-D** (set_user(2)).*
The compressor is stopped when **Err = 0**.
In heating (*set_user(0) = 1*) the compressor starts when **Err > D**.
This value showed on the READING MENU parameter 7.
If the thermostat says yes the compressor can't start in case must be respected the waiting compressor times or the optional function low water volume to avoid antifreeze water alarms.

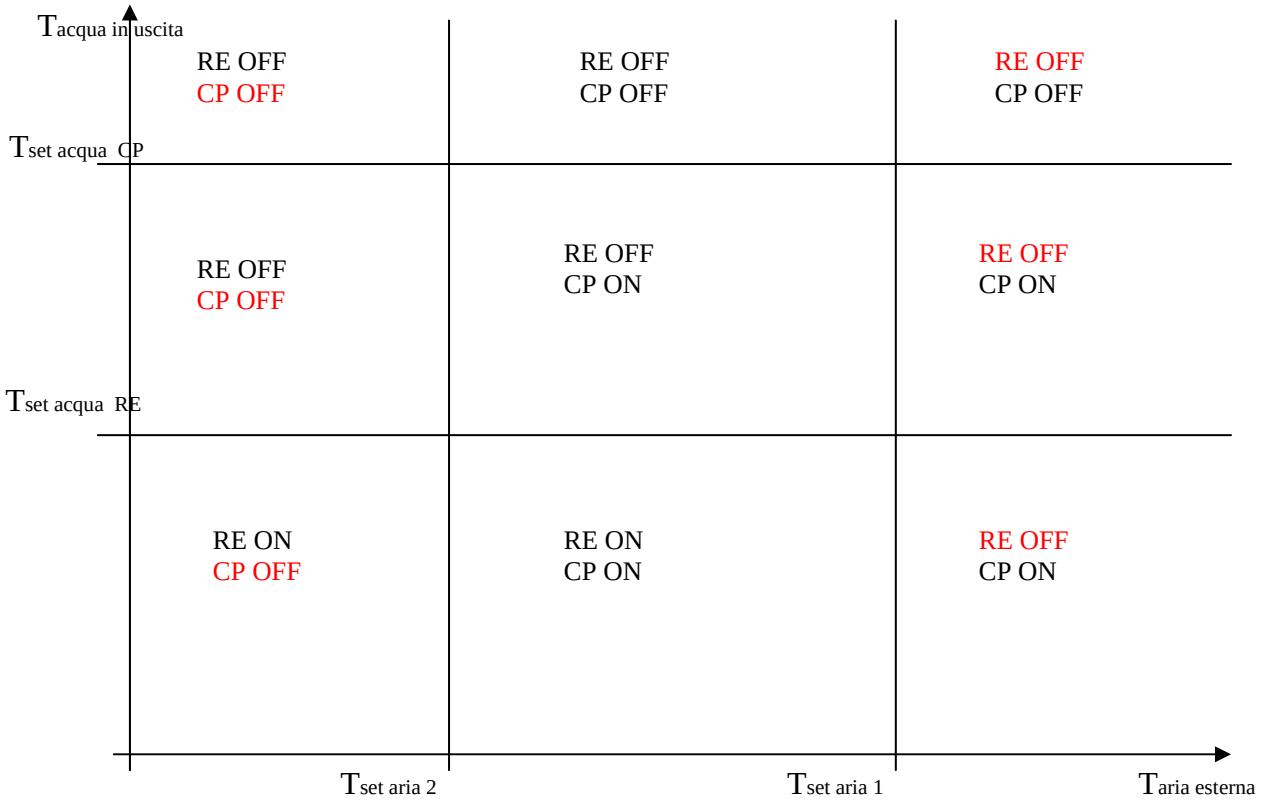
9.0 INTEGRATIVE RESISTANCE MANAGEMENT

Until version 3.75

ONLY FOR UNITS HEAT PUMP VERSION

The digital output regarding the antifreeze heater can be enabled also for the control of an eventual integration by electric heaters in heating mode.
The resistance controlled via two relays using the OD (SSR).
The external air set and relative water set control when to activate the resistance

$T_{set\ acqua\ CP}$: *set_user(3)*
$T_{set\ acqua\ RE}$: set_resistance(2)
$T_{set\ aria\ 1}$: set_resistance(4)
$T_{set\ aria\ 2}$: set_resistance(5)



Picture 1 – Compressor + resistance logic control according to ext. air / water temp.

Since version 3.9

On version 3.9 it was added a new **INTEGRATIVE RESISTANCE AND BOILER MANAGEMENT CONTROL** always controlled by RCR relay

Modifications: modification of existing management + new setting at existing parameter

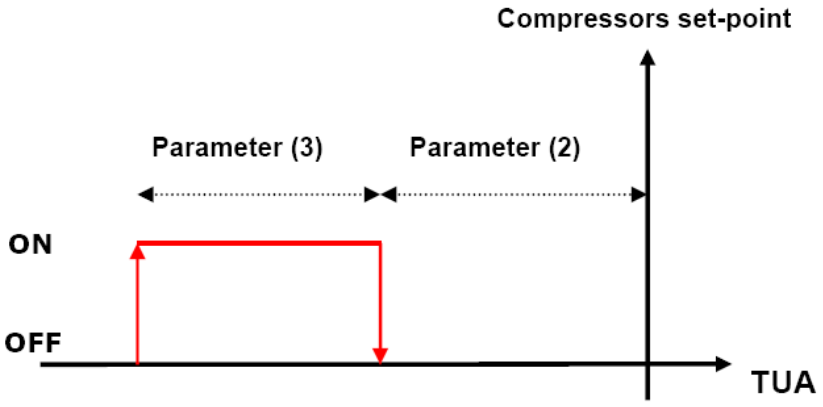
A further setting has been added to the parameter (8) *Installer menu* (Pwd 30),
now the meaning becomes:
0 = no integration resistance (like before)
1 = integration resistance mounted (like before)
2 = boiler accessory present (new)

If parameter (8) = 1 integration resistance mounted

The parameter (2) *Resistanc menu* (Pwd 1) assumes a new meaning. It is no longer the fixed set-point of the resistance but becomes a differential with respect to the compressor set-point.

INTEGRATIVE MODE

It is activated with:
TAE < Parameter(4) Resistance menu
TAE < Parameter (5) Resistance menu



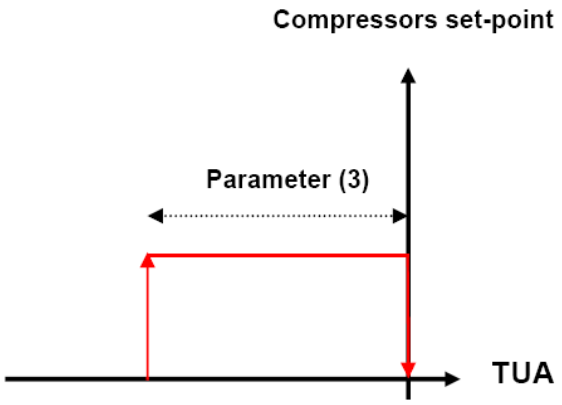
If the production of domestic hot water is requested in this mode, only the compressors are used and the integration resistance is not used.

REPLACING MODE

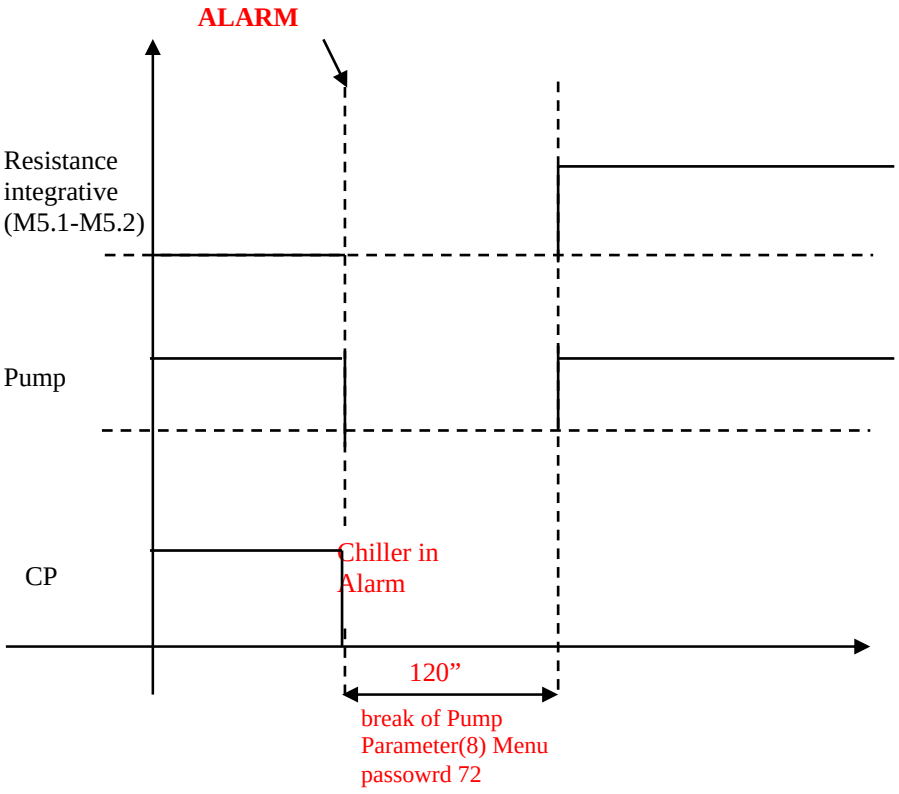
It is activated with:
TAE < Parameter(5) Resistance menu

Not having the compressors available the resistance functioning point shifts in order to have the desired output set-point.

If the heat pump goes into alarm conditions (excluding: flow meter alarm, pump circuit breaker that can be connected in series, inlet water high temperature alarm) the replacement mode is forced.



In case there is an alarm into the refrigerant system the resistences replaces the compressor following this procedure:
1. All loads are switched off
2. Output AE (M1S.8 – M1.8) is activated
3. After 120 sec pump starts
4. After 40 sec where the flowswitch is bypassed the resistances can work according to the water temperature and set point.

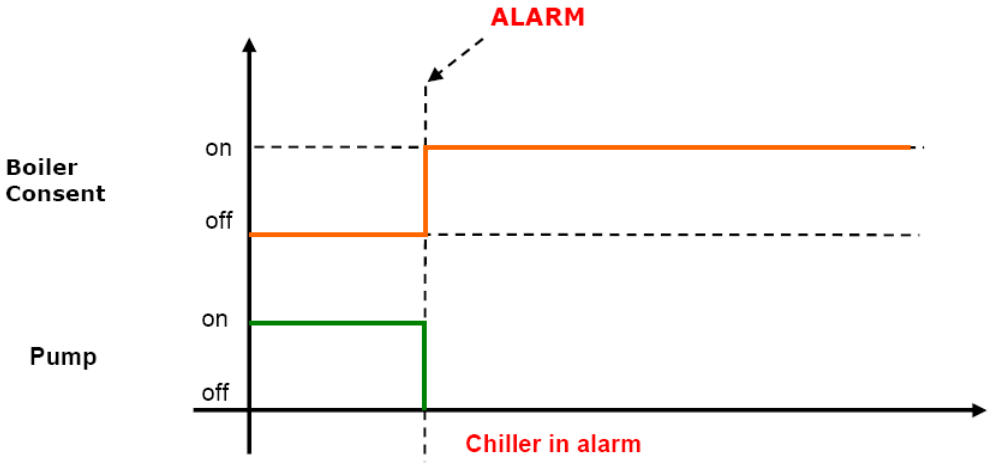


Pic. 2 – Resistance integrative logic in case of alarm

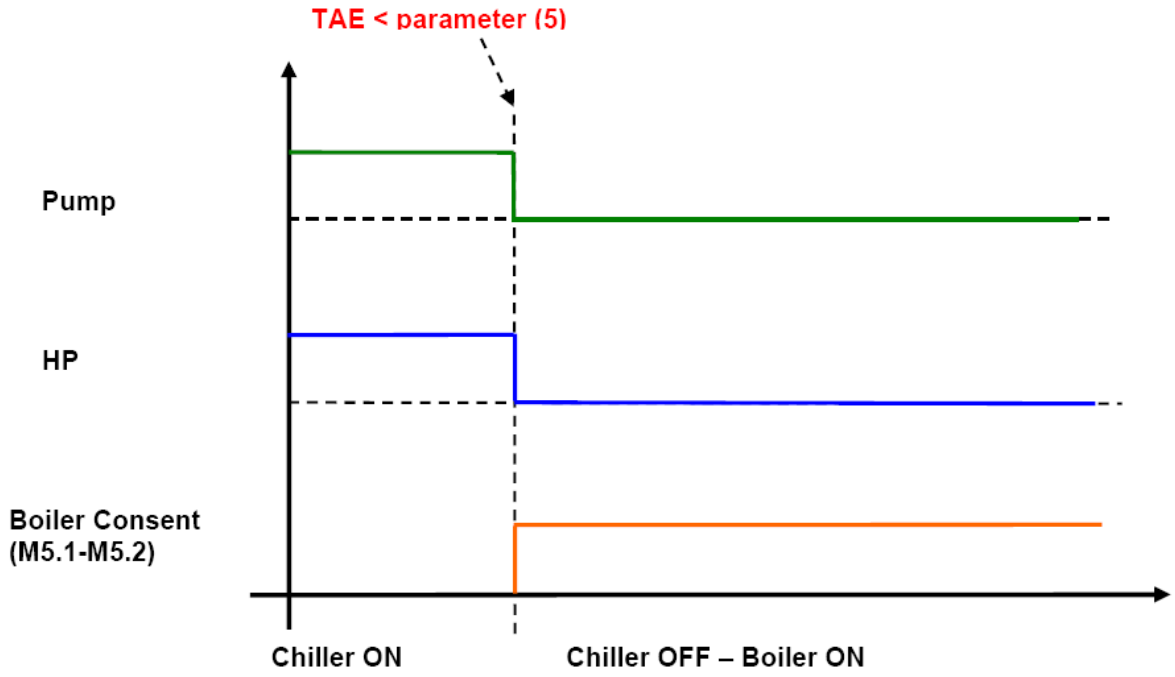
If the production of domestic hot water is requested in this mode, the compressors are not used but only the integration resistance.
If **parameter(8) Installer Menu = 2 boiler accessory present**

New parameter setting (8) *Installer menu* (Pwd30).
With parameter (8) = 2 the SSR outlet (M5.1 – M5.2) is used as consent at the boiler.

- In the case of alarm with unit block and boiler accessory enabled, the pump switches off and the consent at the boiler is activated.



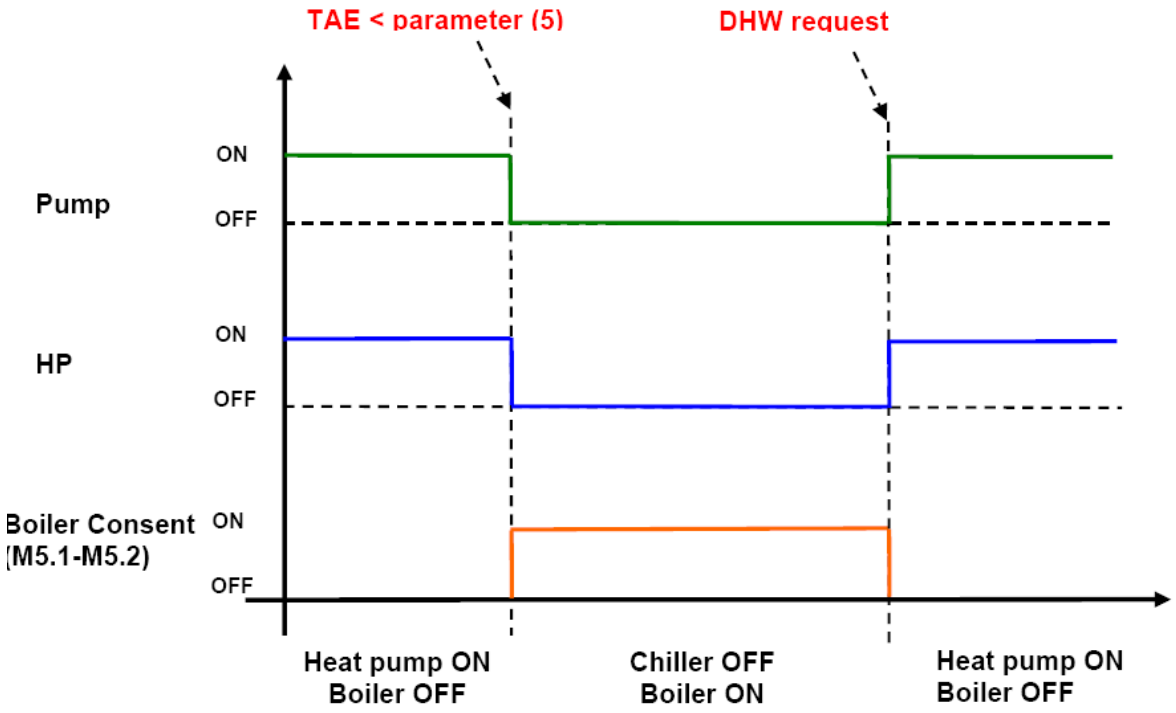
- In replacement mode (TAE < parameter (5) *Resistance menu* (Pwd1) the pump and compressor switch off and the consent at the boiler is activated.



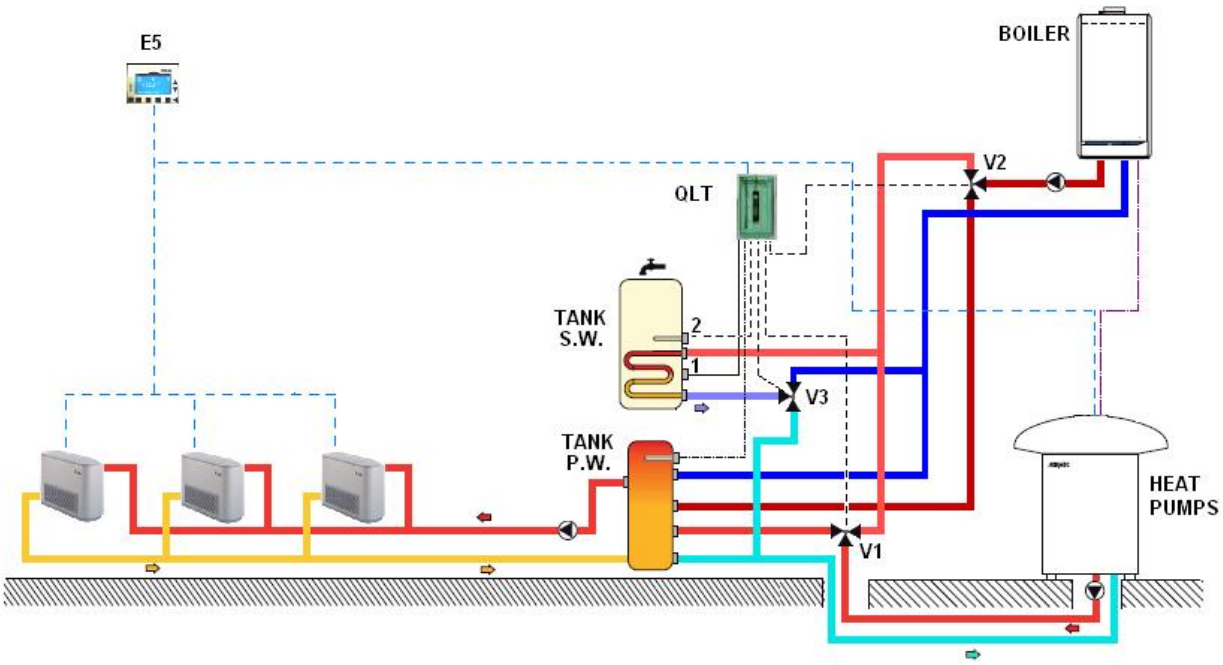
- In replacement mode (TAE < parameter (5) *Resistance Menu* (Pwd1)) if domestic hot water is requested the boiler remains active.

BOILER MANAGEMENT (on SW4.0)

- In integration mode (parameter (5) < TAE < parameter (4) *Resistance menu* (Pwd1)) the consent at the boiler is deactivated and the heat pump functions normally .



BOILER MANAGEMENT in integration (on SW4.1)



Pic 3 – Boiler in integration

To manage the system must be used the DHW device.

This configuration can produces heating system water up to 70°C max because after force Off dynamic interventation the water pump is switch off.

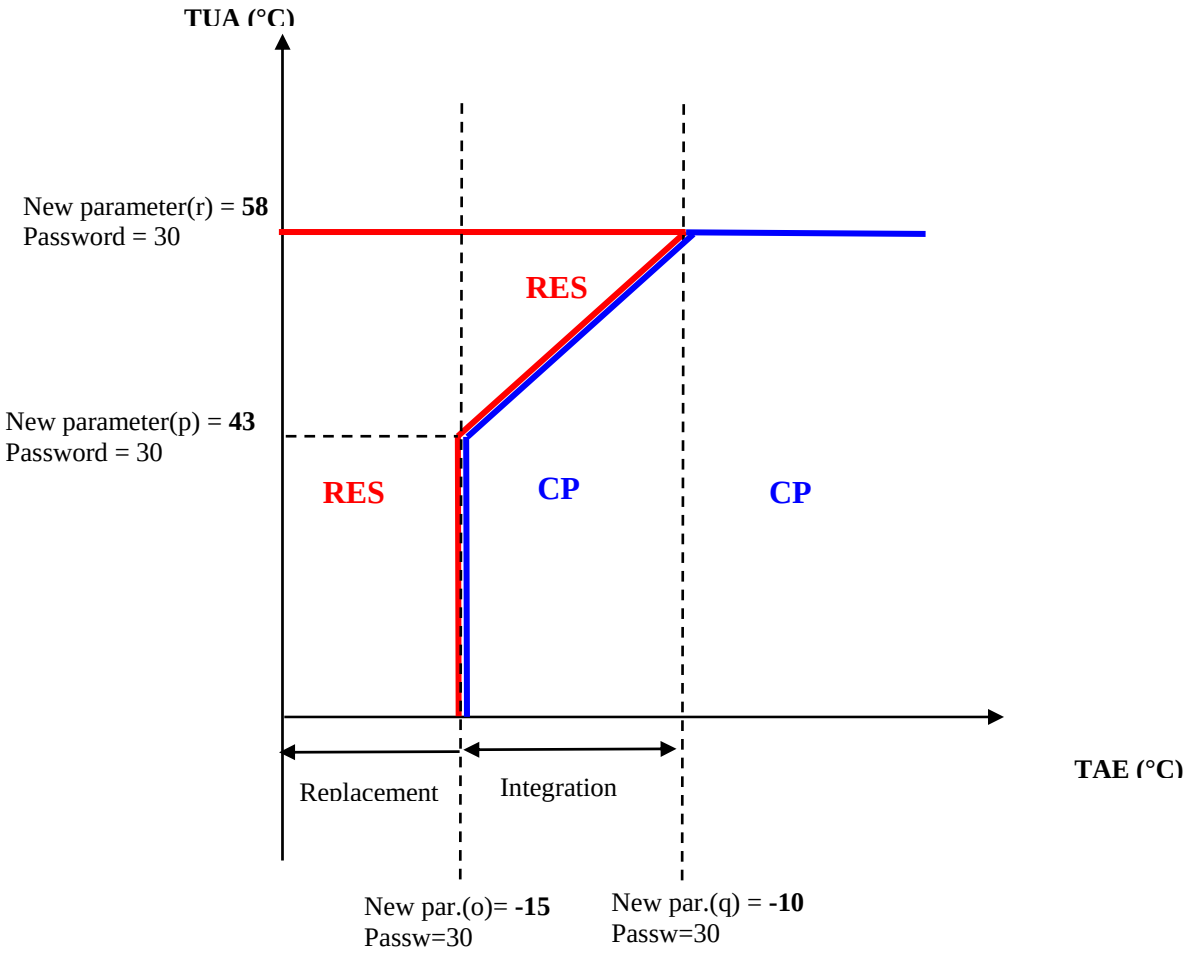
Set_installer(8) = 4 means Boiler managed by DHW.
Boiler is activated only in case we have heating system demand.
The heat pump and boiler never are activated together for domestic water production.

The temperature inside heating system tank is controller by modu-control able to start/stop the boiler according to the set point setted.
In case boiler goes in replacement (force Off dynamic stopped CP or according to external air temperature) unit water pump is stopped and it used the remote water tank heating probe to system temperature control.

New parameter(0) password = 031:
After that ForceOff dynamic stopped CP, the CP restarti f heating water tank T° < Force dynamic – parameter(0).
All is done to prevent fast CP restart/stop.

On version 4.0 and 4.1

New management of integrative resitance: It was introduced a dynamic *Force Off* according to the air temperature and outlet water temperature to determinate the compressor operation limits (in heating and during HDW productio too).

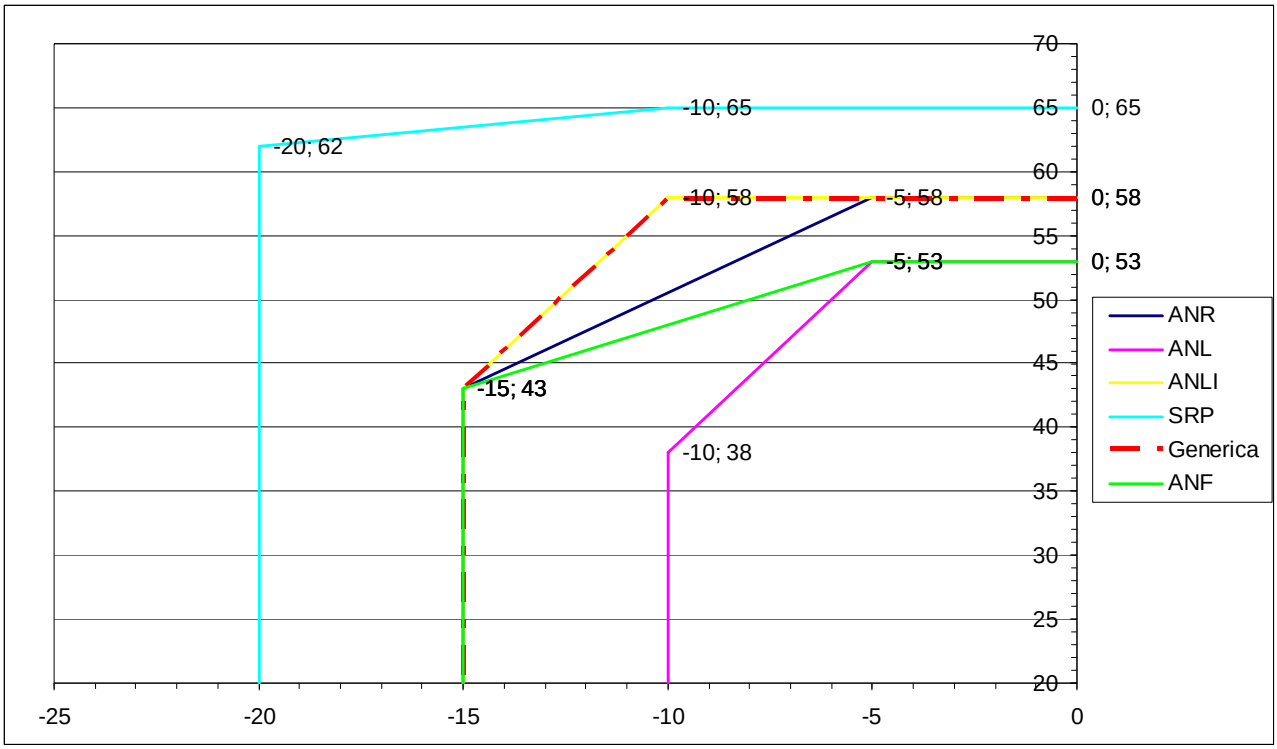


Example: In case HDW set point is 55° and air T° is -10°. Following picture parameter the force off will be 45°.
The compressor works until to have TWout = 45° and then is switched off (respecting minimum working time) and will be used the resistance to arrive at the setpoint 55° .

- Resistance parameters (set_resistance(4) and set_resistance(5)) manages the integration or replacement following standard configuration inside normal operation limits. *When unit goes out of limits the resistance is always used in replacement.*
- Having 4 new parameters the *Force Off Dynamic* works according to the TWout and Tae. When TWout arrives to dynamic force off the compressor is immediately stopped respecting minimum working times.
- When *Force Off Dynamic* is activated inside Integrative function cp OFF and the resistance set point becames the compressor set point.
- Setting the operation limits at the max values THE FUNCTION IS NOT ENABLE and the resistance is used according to the logic of SW3.9. Now the resistance can be automactely used also producing HDW.
- In HDW the resistance is used according to the air and water temperature taking advantages of complete operation limits.

- This function can always used to protect the compressor.
- When force off dynamic is activated it blinks the “small bell” and into the menu password 10 at the parameter 4 is possible to read which water temperature we must wait to restart the compressor.
- SW 4... use generic limit

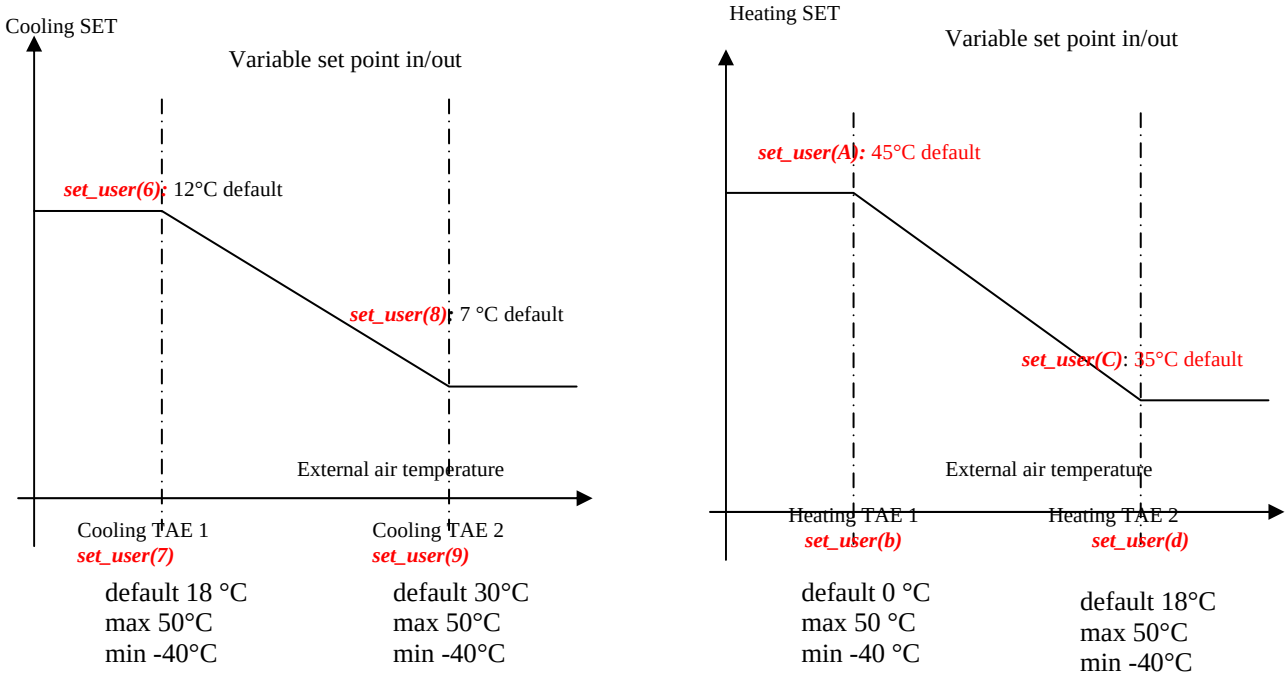
UNITS LIMITS OPERTION



Operation limits

10 COMPENSATION SET POINT

In the regulation electronic Modu_Control logic it is inserted to very in automatic according external air temperature the Cooling / Heating set point to have an optimal confort and a reduction of the electrical consumption.
If the parameter **set_user (5)** is setted up to 1 it is activated the algorithm to calculate the set point in accordance the external air temperature.
The set points are calculated following two linear functions showed in the diagrams below.
The air external probe SAE must be install in the cases where it is lack



Pic 4 – Compensation set point logic having outlet water control regulation

11 COMPRESSOR LOGIC CONTROL

In the compressor Modu_control management is inserted a logic to respect the minimum compressors operation times.
Inside the range of operations the compressor must respect three rules (represented in three parameters):

- Minimum working time **$t_{on\ min}$** (**compressor menù (1)**, default 120 sec), in order to have a good lubrification of the compressor's parts.

- Minimum turn off time **$t_{off\ min}$** (**compressor menù (2)**, default 180 sec), this time it was chosen to equalize the pressures before the next start.

- Maximum starts number per hour **N_{avv}** (**compressor menù (3)**, default 12 starts/h), so the minimum compressor stop time between two starts will be **$3600/N_{avv}$**.

Every time that compressor is started will be in operation (if we will not alarms or force off stops) for a time :
$t_{on} >= \mathbf{t_{on\ min}}$
(t_{on} it is the real working time of compressor), also in the event it comes given the stop of compressor (to avoid that compressor times control is by-passed from automatic controls connected to the ON/OFF remot contact).
When every time the compressor is stopped it will be off for a minimum **t_{off}** time calculated when the compressor it was stopped according a minimum value that it depends from parameter
$t_{off} >= 3600/\mathbf{N_{avv}} - t_{on} >= \mathbf{t_{off\ min}}$

N_{avv} is the starts up numbers per hour
t_{off} is the stopping compressor time
if $3600/N_{avv}-t_{on} < t_{off\ min}$ and $t_{off} = t_{off\ min}$ compressors times on the bi-compressor units

12 COMPRESSORS TIMES (ONLY ANR)

If parameter *set_compressor(0)* is different of zero, it means that 2° compressor installed and its % power inserted on that parameter.
So the compressors start / stop procedure must be respect:

Parameter	Note
Minimum working time ($\mathbf{t_{min\ ON}}$)	After the start up the compressor works minimum for that time
Minimum OFF time ($\mathbf{t_{min\ OFF}}$)	It is the minimum time that compressor must stay off
Start up delay time of 2° compressor ($\mathbf{t_{coppia}}$)	It is the time between the two compressors start up
Max start up per hour ($\mathbf{N_{avv}}$)	The start up of compressor also depends from a this delay time (60 min/N_{avv})

The total working time per each compressor is recorded.

To start the compressor

a) $t_{min\ OFF}$
b) t_{coppia}
c) 60 min / $\mathbf{N_{avv}}$

To stop the compressor

a) $t_{min\ ON}$

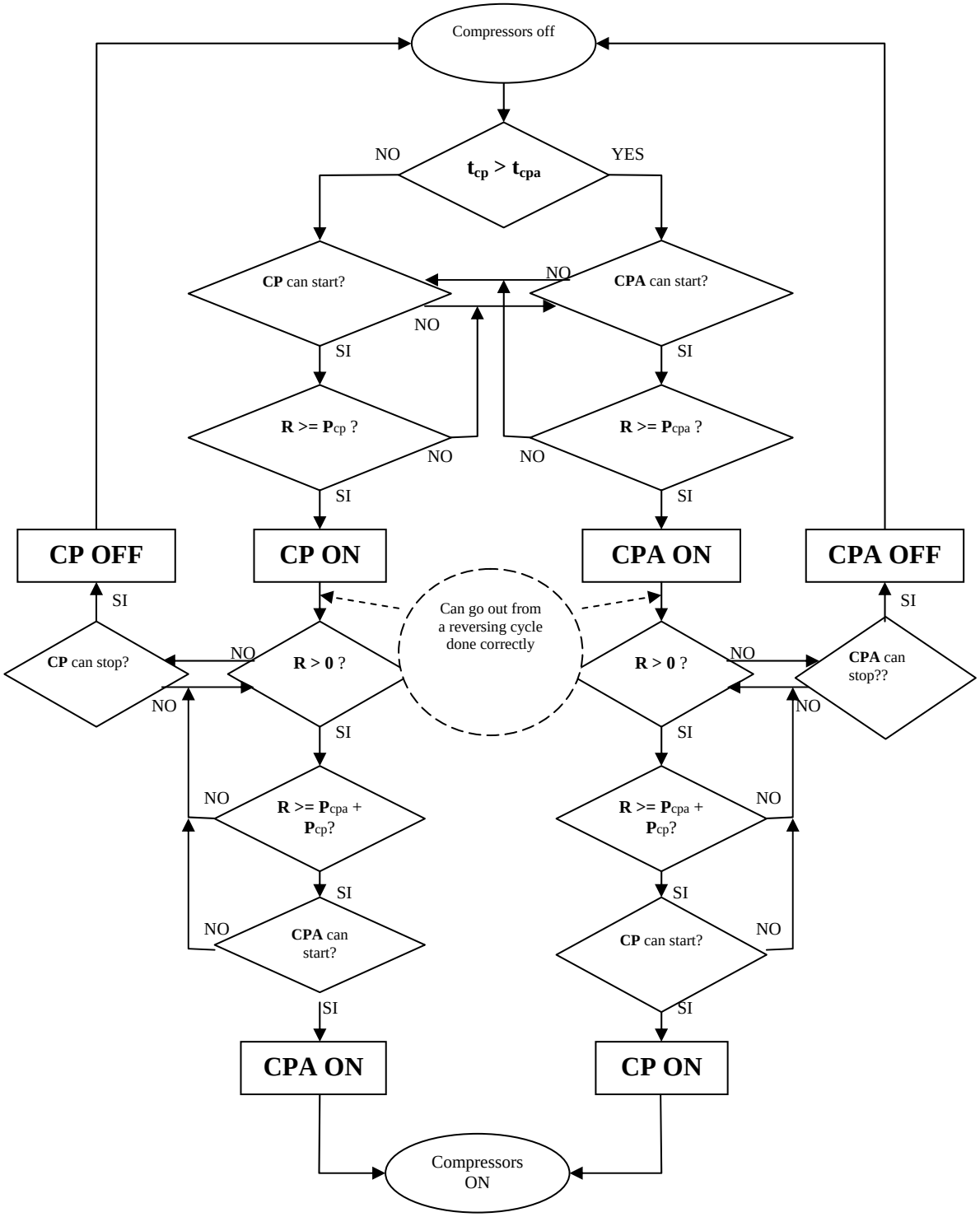
Softstart

The parameter *set_compressor(A)*, allows toh ave a softstart or smartstart device to reduce the compressor start up currents.
This parameter forces the OFF time about compressor (can arrive to 3 minutes)
Also during the defrosts this time is respected.

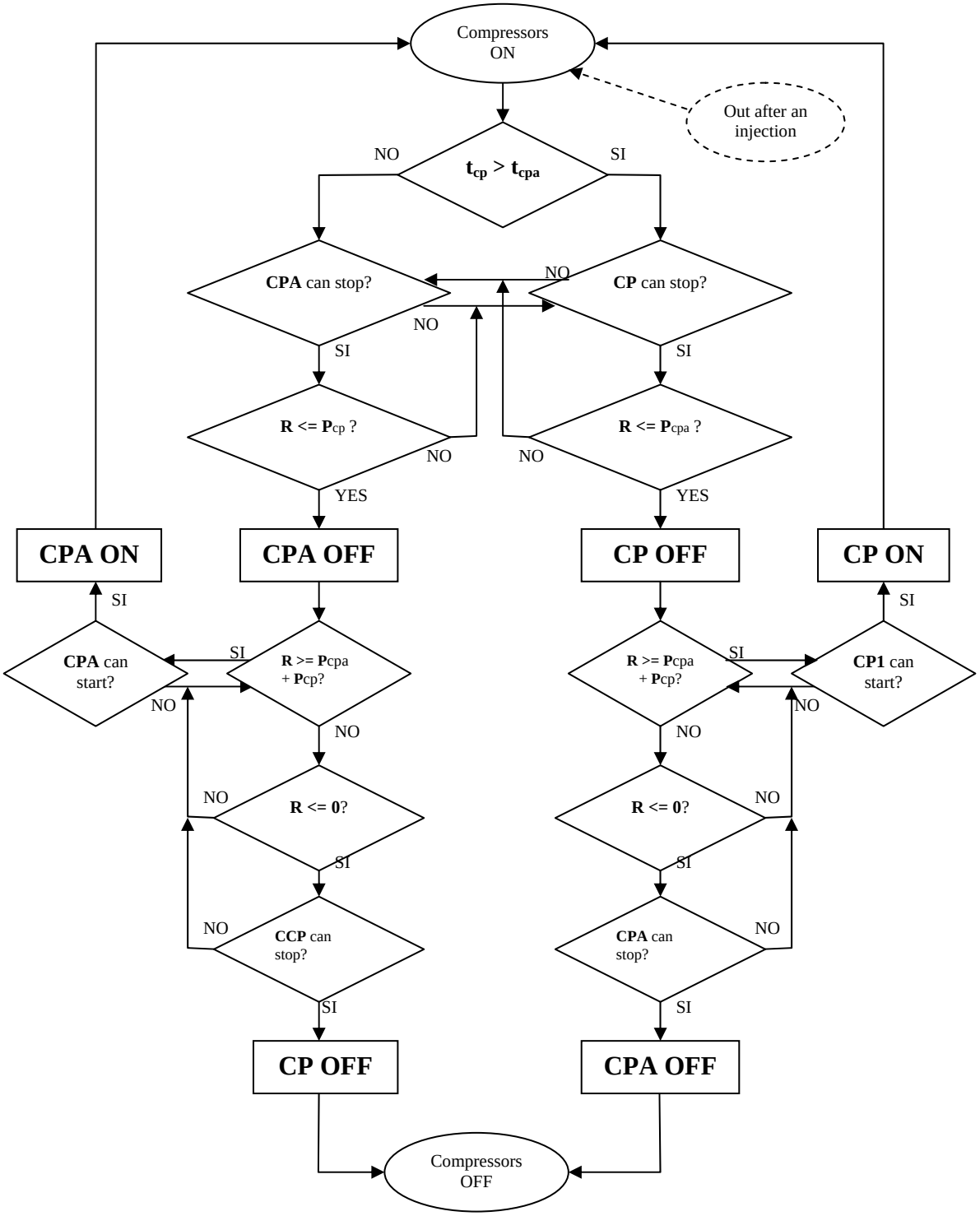
Regulation

ON this table the procedure to start the compressors showed.
The % of cooling demand ® following algorithms proportional, integral and derivative calculated. They are **|Err(t)/D|** :

Symbol	Meant
t_{cp}	Total working hour of primary compressor
t_{cpa}	Total working hour of auxiliary compressor
R	Percentage of cooling demand (0 – 100%)
Sp_{cp}	Number of primary compressor start up
Sp_{cpa}	Number of secondary compressor start up
P_{cp}	Capacity % delivered from first cp (100 - *set_compressor(0)*)
P_{cpa}	Capacity % delivered from second cp (*set_compressor(0)*)
CP	First Compressor
CPA	Second Compressor



Pic 5 – Sequency of compressor start up



Pic 3 – Sequency to stop compressors

13 OUTLET WATER TEMPERATURE CONTROL in case of LOW WATER CONTENT

This idea was thought to produce chillers and heat pumps without storage tanks but only with water pump in order to reduce the costs and to offer a product similar to our competitors.
So if the chiller will be installed in a system with low water content the logic of regulation about set point must be adjusted at this particular typology of system.

The new board can manage this kind of regulation but with as exception of the our competitors, this function can be enable or not according **Dip 6**. so in case of problems where the storage tank must be installed thanking the flexibility of regulation it is possible to insert the standard kind of regulation.
At the standard parameters of the regulation :

- Cooling/Heating standard set point
- Proportional band
- Integral time
-

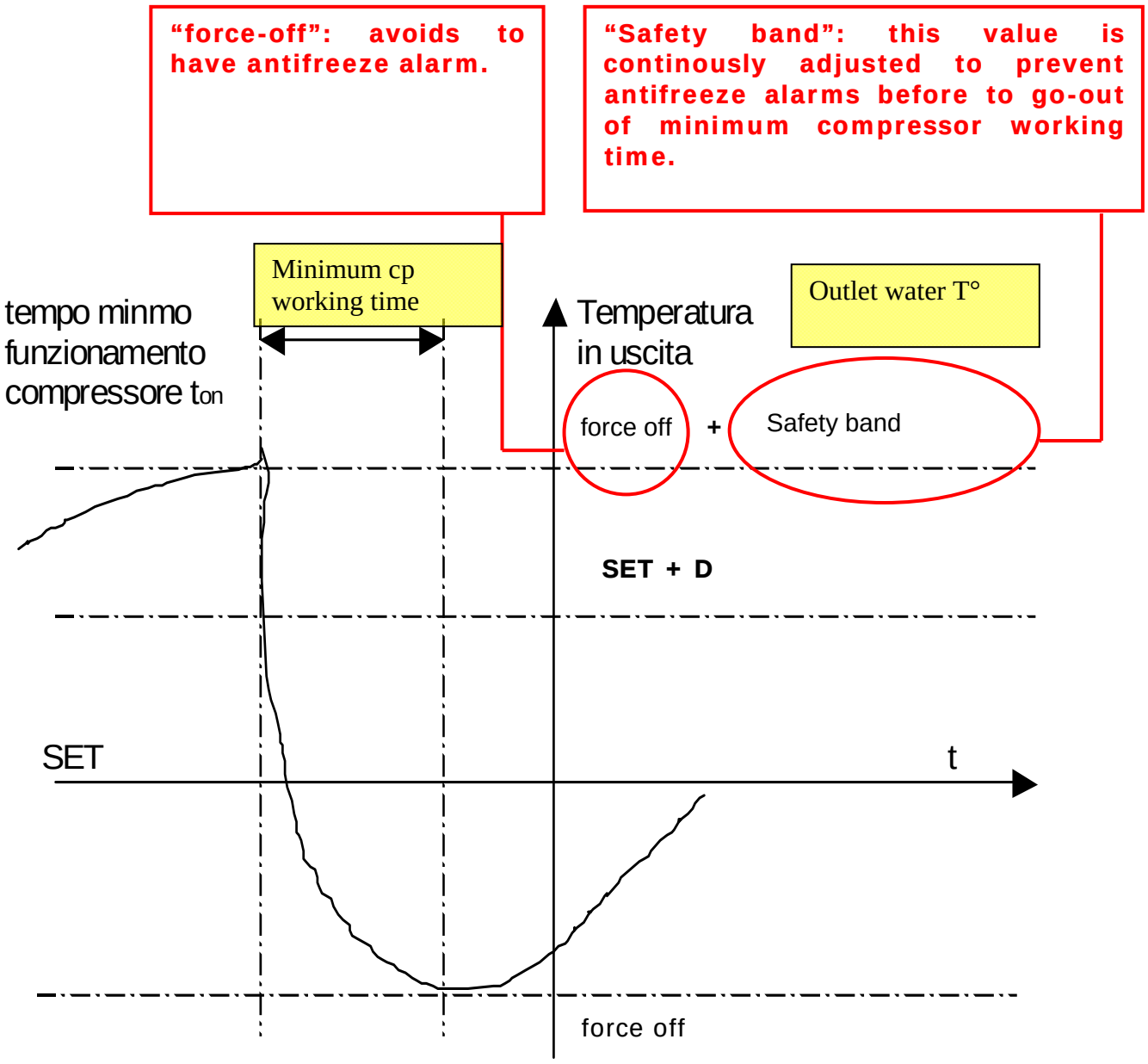
Will be added

- Differential 'force off'
- Delta Toff on safety band

These two last parameters are used like an escape to avoid to have water temperatures too cool/warm that can give out antifreeze or high pressure alarms. There are a water temperatures thresholds and when it is crossed the compressor is forced to stop.
In the meantime we want to avoid that compressor is stopped before to have worked for the "minimum working time" necessary to protect the compressor.

L'algorithm calculated tries to prevent l'evolution of the outlet water temperature and to find a value of the outlet water temperature who allows to start the compressor and the compressor must work at list for the minimum working time (120").

The safety band BS is the value in °C to add (in heating to subtract) to the threshold force off in order to have a new threshold of outlet water temperature where will be allowed the start of compressor.


"force-off": avoids to have antifreeze alarm.
"Safety band": this value is continously adjusted to prevent antifreeze alarms before to go-out of minimum compressor working time.
Minimum cp working time
Outlet water T°
tempo minmo funzionamento compressore ton
Temperatura in uscita
force off
+
Safety band
SET + D
SET
t
force off

Picture 14 – Control of force off limit with outlet probe in cooling

a) Variation of the Tia, Tua after the compressor start in a system with low load

Legend:

Tua (0): outlet water temperature at the start up of the compressor

Tua (t): actual outlet water temperature

Tia (t): actual inlet water temperature

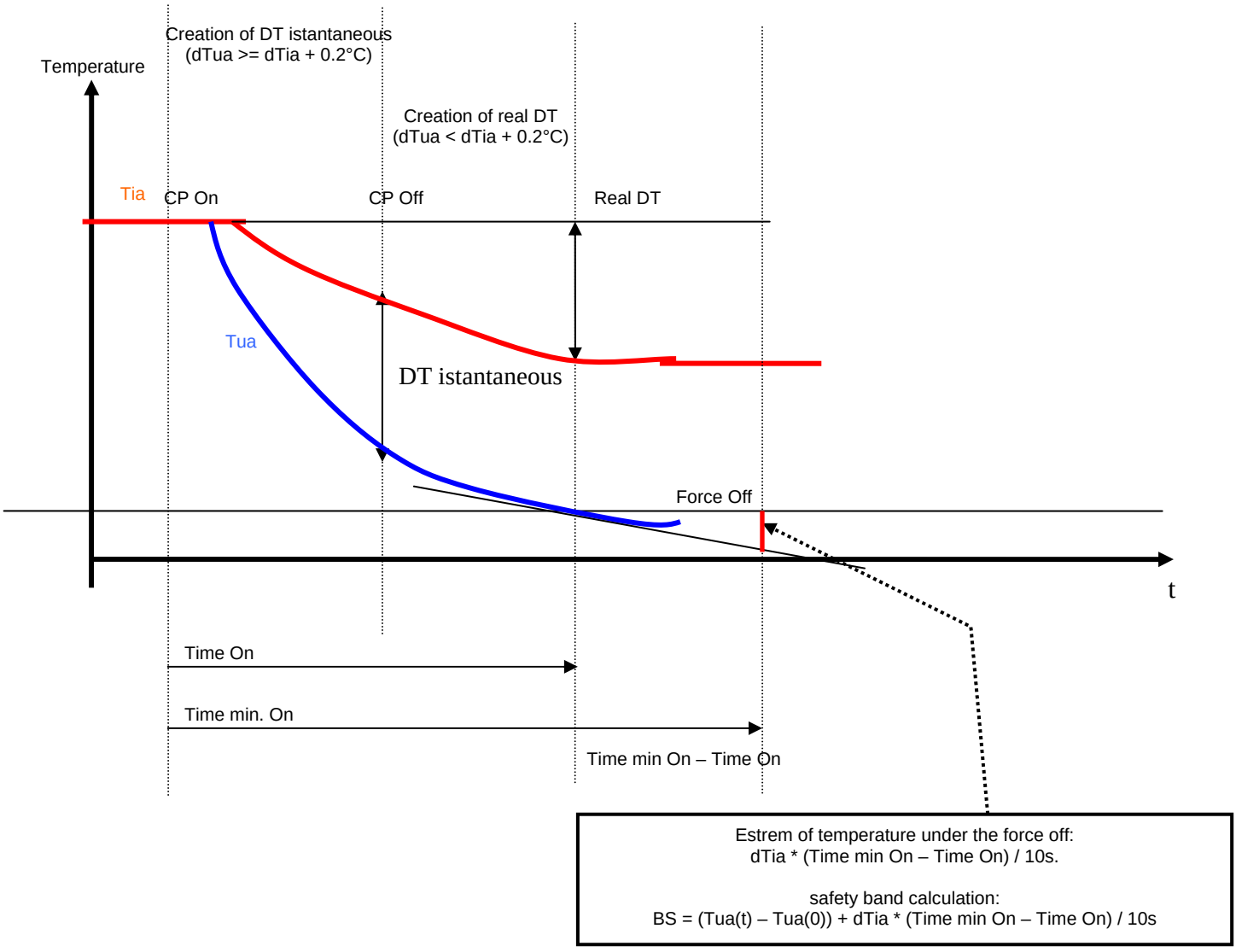
dTua = Tua(t) – Tua(t-10s): Variation of outlet water temperature in the last 10 seconds

dTia = Tia(t) – Tia(t-10s): Variation of inlet water temperature in the last 10 seconds

BS: Safety band to re-start the compressor

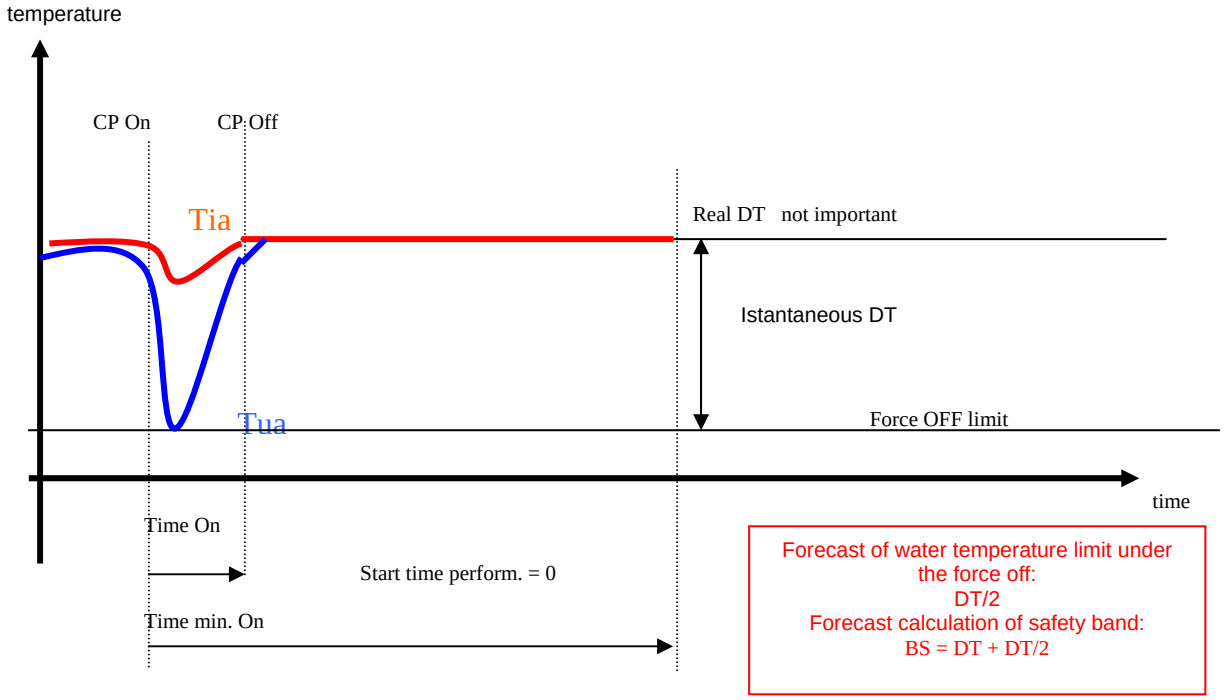
DTI: Istantaneous delta t

Tforceoff: force off threshold


Creation of DT istantaneous
(dTua >= dTia + 0.2°C)
Temperature
Creation of real DT
(dTua < dTia + 0.2°C)
Tia
CP On
CP Off
Real DT
Tua
DT istantaneous
Force Off
t
Time On
Time min. On
Time min On – Time On
Estrem of temperature under the force off:
dTia * (Time min On – Time On) / 10s.
safety band calculation:
BS = (Tua(t) – Tua(0)) + dTia * (Time min On – Time On) / 10s

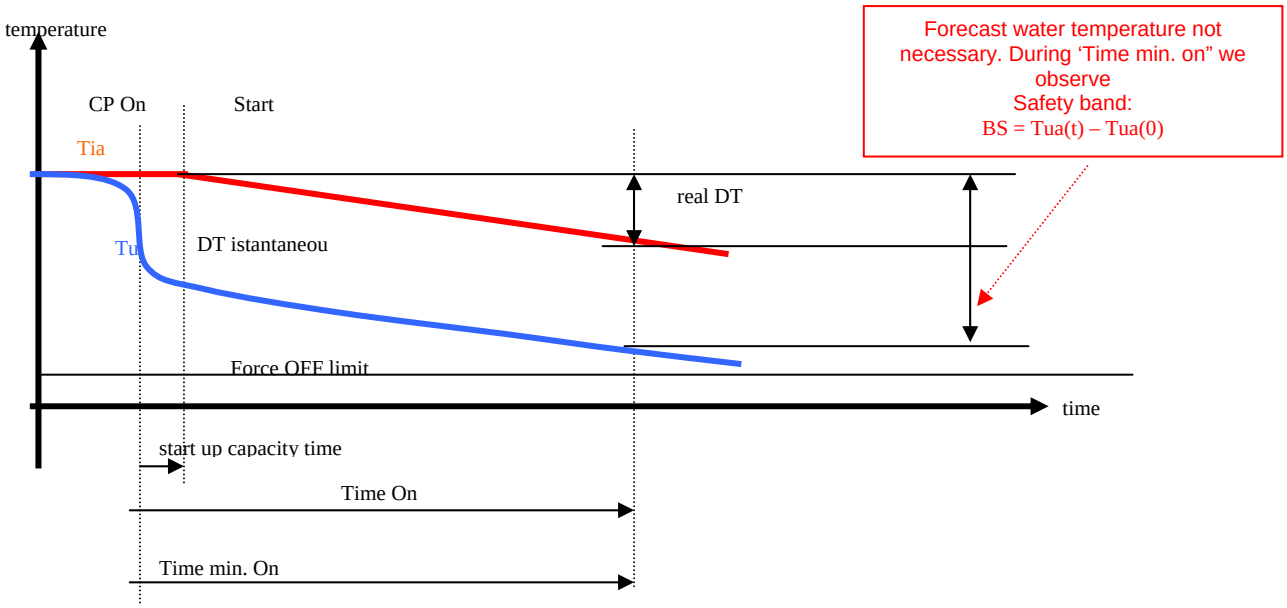
Pic. 15 – Force off point and forecast calculation of safety band BS

b) Start up water temperatures diagram having low water flow.



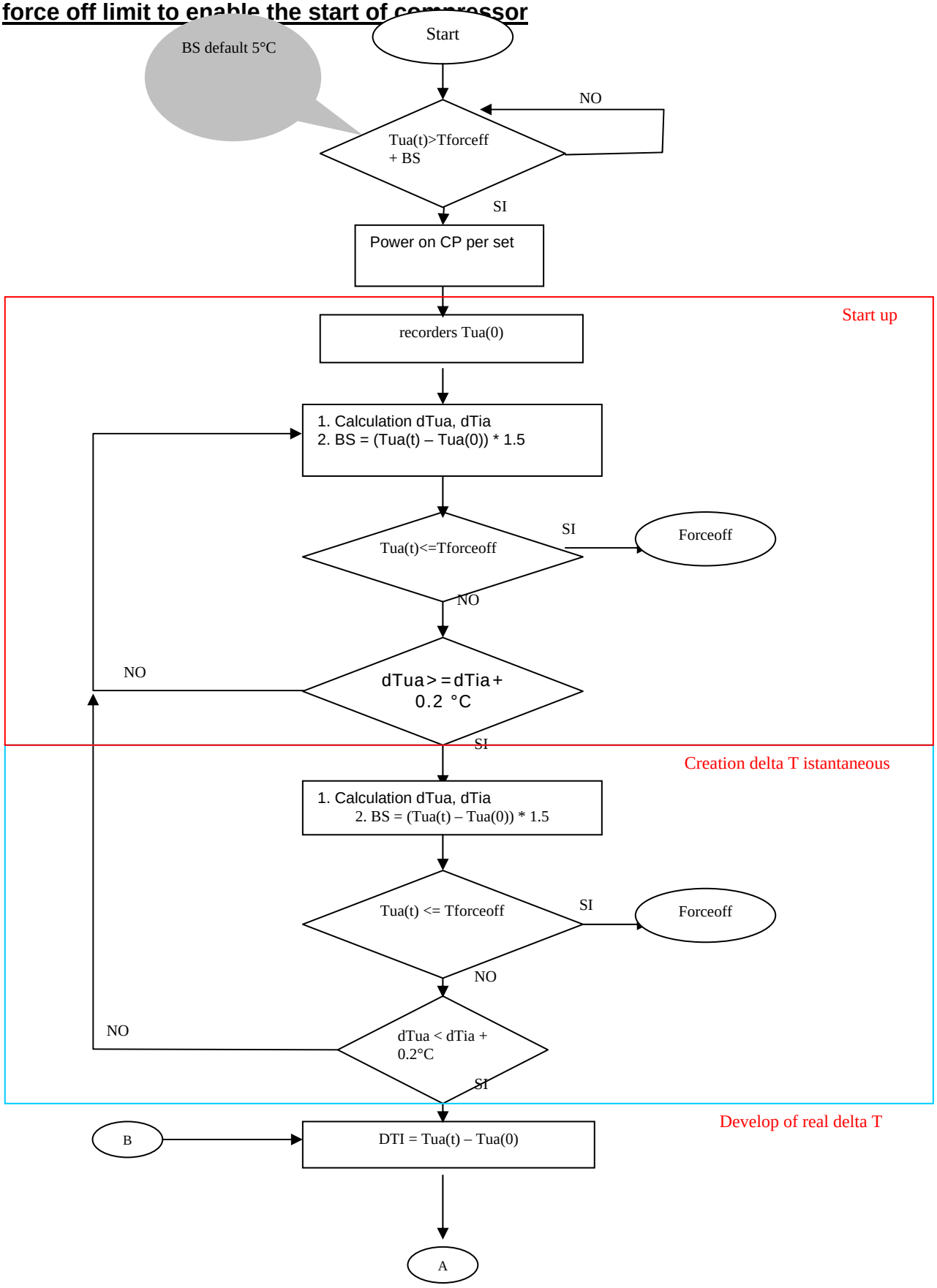
Pic. 6 – Off by force off and forecast of water temperature limit and safety band limit BS

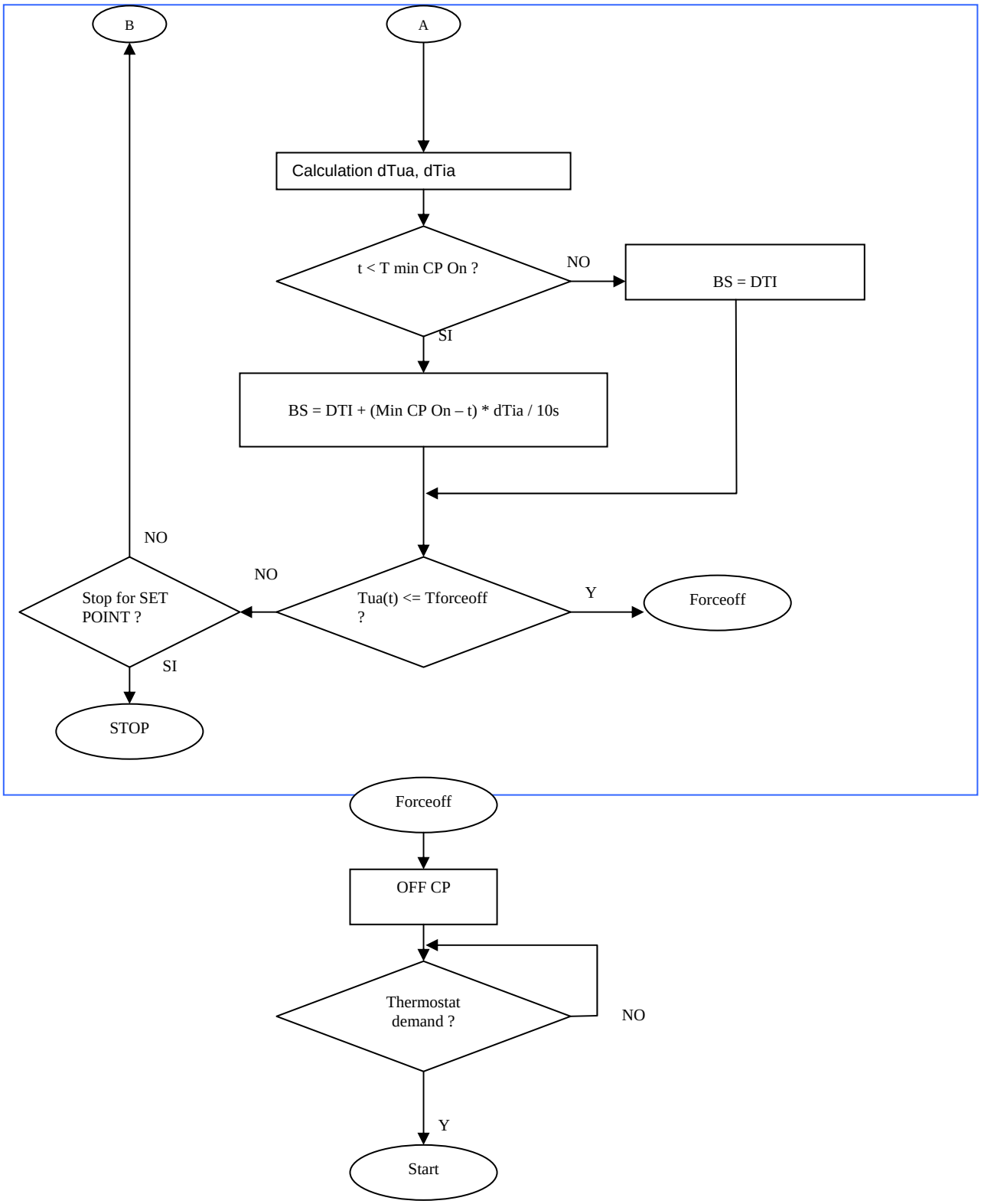
b) Start up water temperatures diagram having nominal water flow medium load demand



Picture 7 – Force off limit and forecast of safety band temperature BS

Algorithm to calculate the differential of safety BS between Outlet water control and force off limit to enable the start of compressor





Pic 8 – Algorithm to calculate the BS band to compressor start up having low water content

14 Low water content control (ANR)

If the function by dip-switch is activated, the parameter $\mathbf{t_{coppia}}$ (*set_compressor(4)*) is forced to $\mathbf{t_{min\ ON}}$ (*set_compressor(1)*): Every time that first compressor starts, it will work for the minimum working time before to allow to start the second compressor.
This is to have a possibility to stop the first one compressor if the set condition say that without to have risks to arrive to the force off limit.
The algorithm about low water volume used for the start of first compressor.

14a Pull down

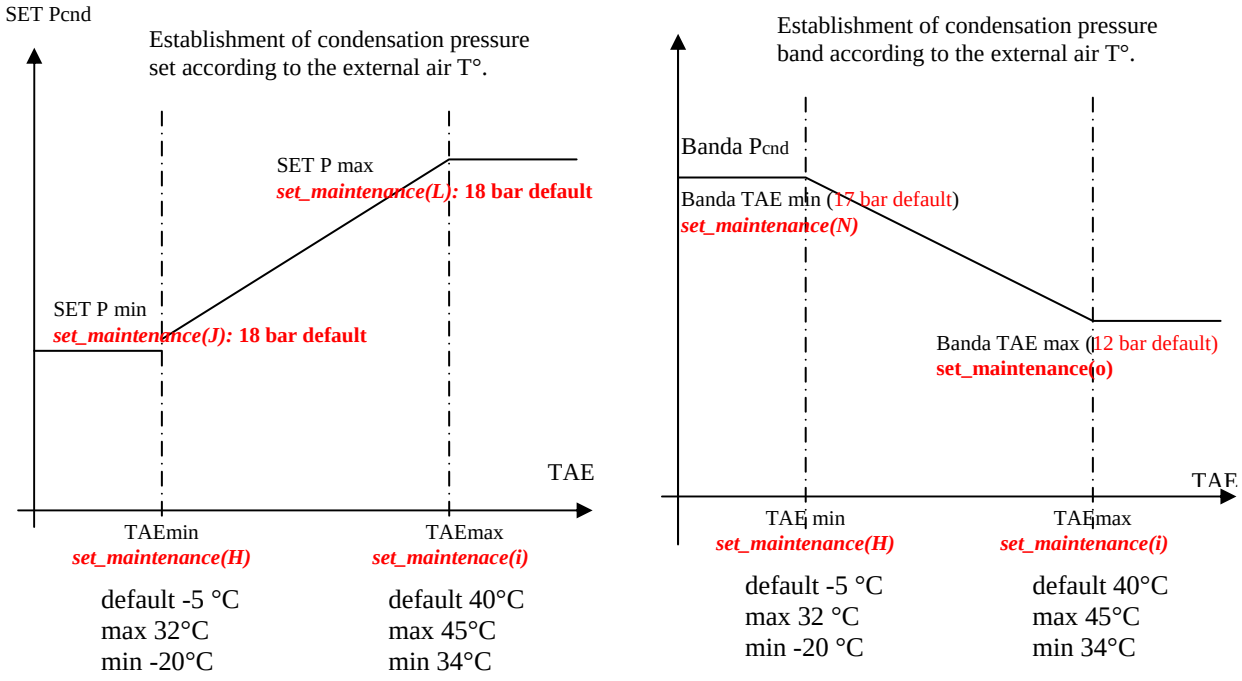
The pull down function allows to don't start the second compressor in case in one minute there is a variation of water temperature bigger of $\mathbf{T_{pulldown}}$ *set_compressor(9)*, activated for units configurated like bi-compressor.

15 CONDENSATION PRESSURE CONTROL (DCPX)

When can be used this device, it controller via dc signal 0 – 10 volt.
The DCPX is permitted from dip-switch 7 on ON.
Every time that fan starts the controller sends for 3 seconds a signal of 4Vdc and then it reachs to the voltage set.
With Inverter compressor the fan start together with the compressor.
During the functioning in cooling mode the fans never stopped.
After to have stopped the compressor the fans work for another minute.

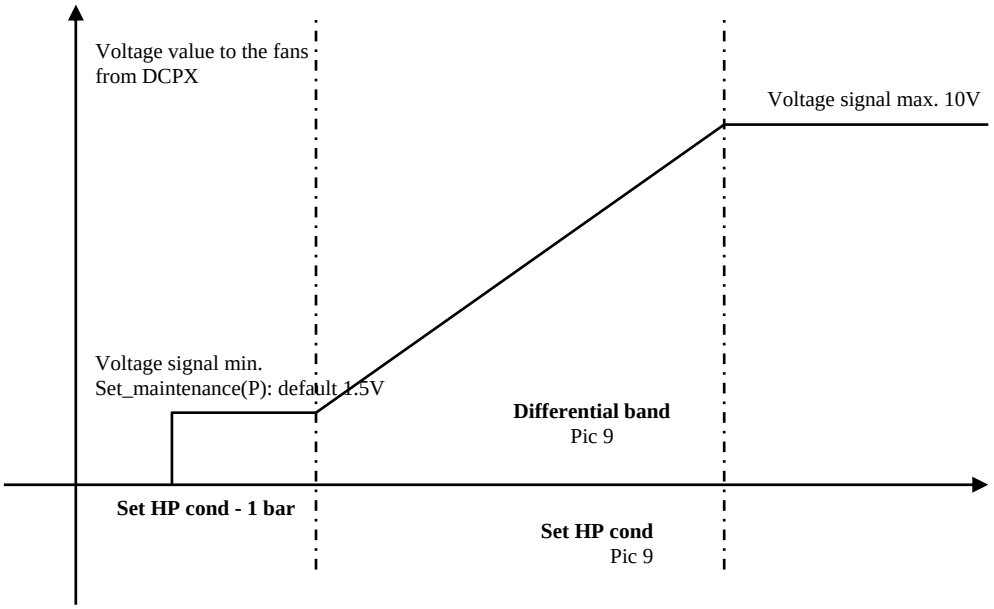
COOLING PRESSURE CONDENSATION CONTROL

The control of the condensation pressure is proportional according to:
• in cooling mode the set point and the differential are determined from the parameters configuration and external air temperature. All is done in order to have a control of the condensation pressure at values that avoid to have return of liquid at the compressor and to have a good level of noise (fans work with a lower speed).
These parameters are inside 'maintenance menù'.

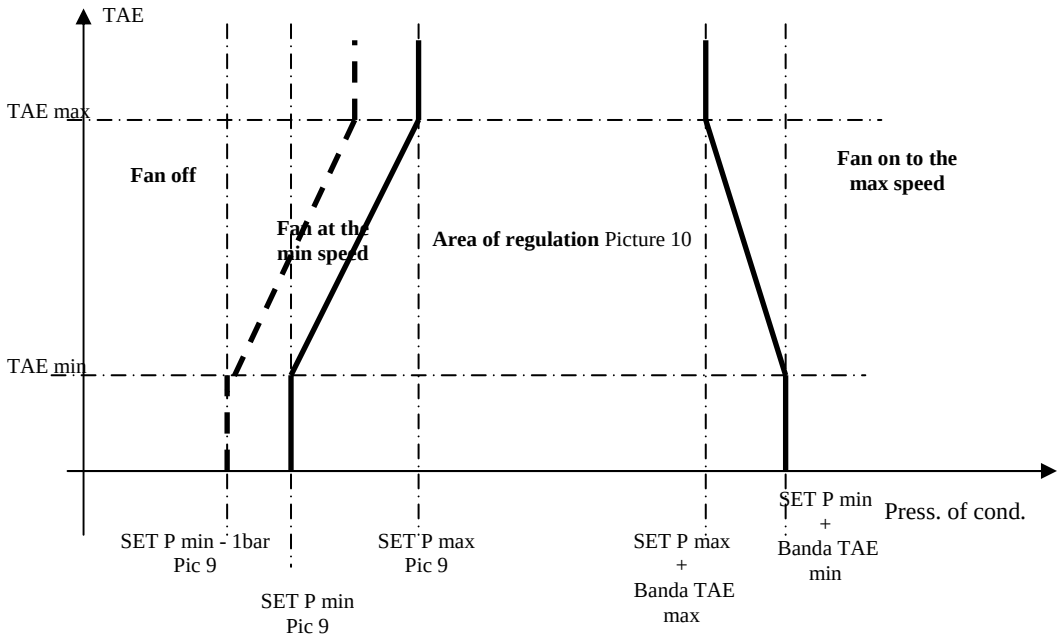


Pic 9 – Condensation pressure control in cooling mode

The regulation in only proportional like showed on Picture 20



Picture 10 – Condensation pressure control in cooling

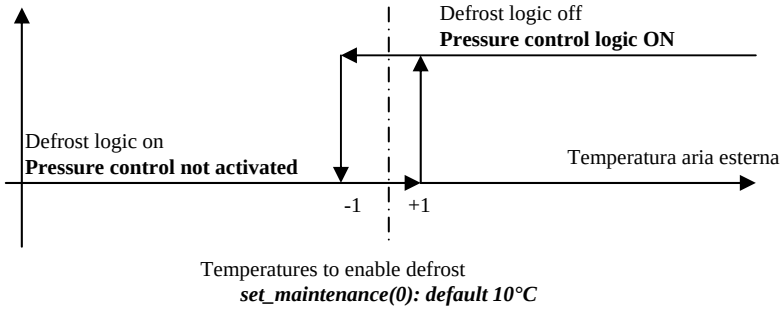


Picture 11 – the diagram shows the correlation between air external T°, condensation pressure and fan speed

The start up of fans is always done sending 4 volt dc to the DCPX for 3 seconds to garantee a correct fans start up.

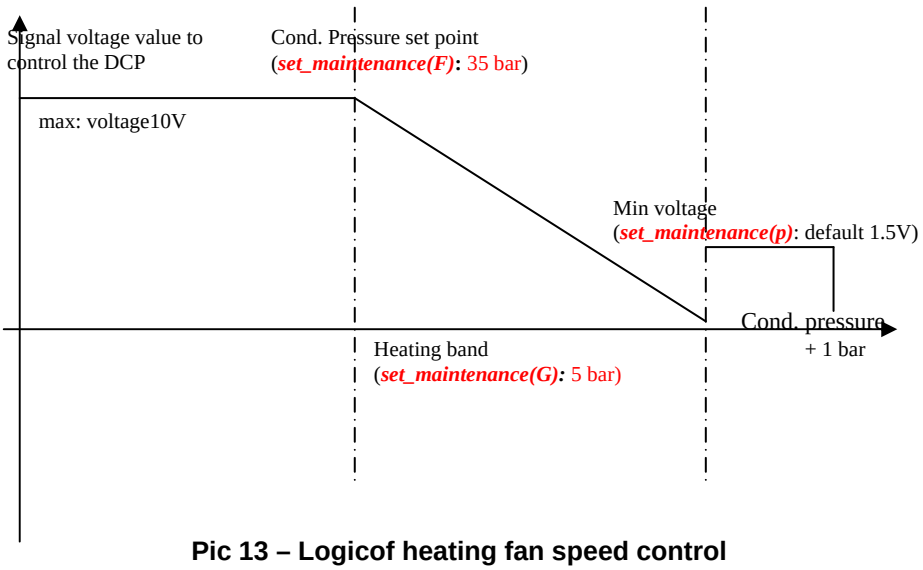
15a CONDENSATION PRESSURE IN HEATING MODE

This logic allows to thge unit to work in heating mode also with high external temperatures. It depends from air external temperature that must be installed. If the sensor it isn't connected the fans are always full speed and defrost logic activated.



Pic 12– Condensation pressure control in heating mode

The control is only proportional with set and differential fixed.



Pic 13 – Logicof heating fan speed control

16 DEFROST

The defrost of exchanger in heating mode is activated only if the external air temperature and exchanger evaporator temperature are under fixed limits according to the parameters:
set_maintenance(0) 10°C.
set_maintenance(1) -2°C.
When these conditions are satisfied and the low pressure delta P too, set maintenance(2) 0.4 bar.

Defrost starting

Inside the table are showed the parameters able to start a defrost on units with single compressor.

#	Step
1	Compressor start up
2	The time t_{avv} (*set_maintenance(4)*: default 5') is waiting to read a steady LP pressure
3	The P_{set} calculation is doing = medium Lp value of lst one minute
4	When the conditions are satisfied: - The medium LP pressure (aduste every 5'') is $P_{ev} < P_{set} - \Delta P_{sb}$ (ΔP_{sb} = delta LP pressure = *set_maintenance(2):* default 0.4 bar) - External air and exchanger temperatures are under the limits *set_maintenance(1)* -2 °C, and *set_maintenance(0)* 10 °C (Pic.22) - Outlet water temperature > 30°C or are 20' that unit works without reachs this temperature DEFROST ON

Table 3 – sequence to enable a defrost single cp

Defrost on bicompressors units (ANR)

Inside the table are showed the parameters able to start a defrost on units with double compressors.

#	Step
1	Compressor/compressors start up or after an end of hot gas injection
2	The time t_{avv} (*set_maintenance(4)*: default 5') is waiting to read a steady LP pressure If is starting/stopping the second compressor the count down time t_{avv} restart from zero
3	The P_{set} calculation is doing = medium Lp value of last one minute
4	*If the second compressor is starting/stopping by setpoint, if the value max(P_{set} - P_{ev}) recordered before 2°cp start/stop, is positive,is subtracted of* ΔP_{sb} (ΔP_{sb} = *set_maintenance(2):* default 0.4 bar) and all restart from point 1
5	When the conditions are satisfied: - The medium LP pressure (aduste every 5'') is $P_{ev} < P_{set} - \Delta P_{sb}$ (ΔP_{sb} = delta LP pressure = *set_maintenance(2):* default 0.4 bar) - External air and exchanger temperatures are under the limits *set_maintenance(1)* -2 °C, and *set_maintenance(0)* 10 °C (Pic.22) - Outlet water temperature > 30°C or are 20' that unit works without reachs this temperature DEFROST ON - or all these conditions are satisfayed: - Air T < set_maintenance(0) 10°C and exchanger T < set_maintenance(1) -2°C and - Discharge T°> limit of parzialization. Set_factory(6)- set_factory(5) = default 130°

Table 4 – sequence to enable a defrost double cp

Kind of DEFROST

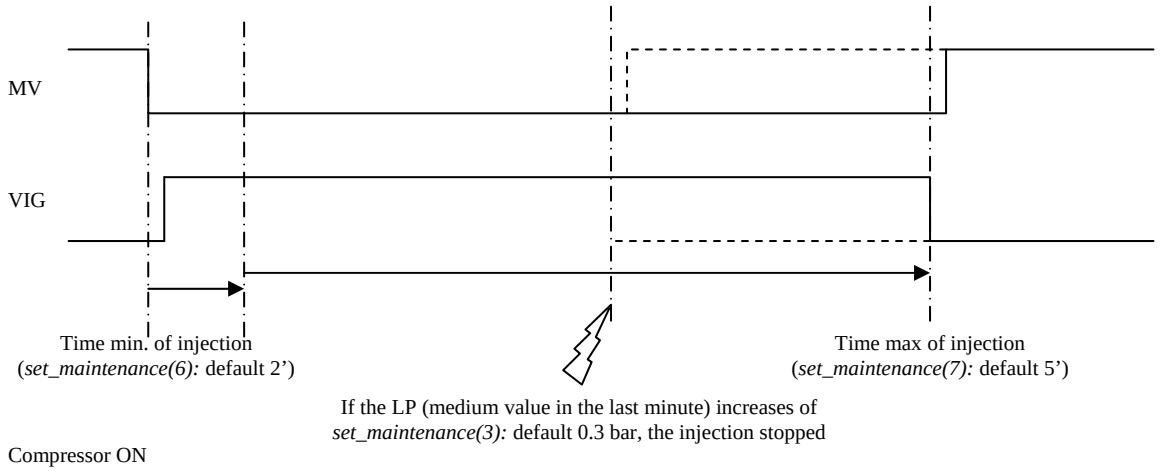
When the defrost is decided the controller decides the kind to do.
It is usually prefered the defrost by hot gas injections.
If the conditions showed on table 17 are present, the defrost is done only by reversing cycle using 4 way valve.

Conditions to enable 4 way defrost cycle
If one of these conditions is true: - N (*set_maintenance(8): default 3*) defrosts by hot gas injections were finished for max time. - The time between two defrosts was reduced for N times continously. - Are 15' after compressor start up and the water temperature is < 30°C - The dip switch configuration actives only defrosts by 4 way valve, dip switch 2 in ON - The LP is lower the limit *set_maintenance(t). Under this pressure only the reversing cycle defrosts are enabled.* - The discharge temperature is under the limit *set_maintenance(u). Under this pressure only the reversing cycle defrosts are enabled.* - The LP pressure is to parameter limit *set_maintenance(A): default 2.8 bar* - *Are tot minutes (set_maintenance(E)) of cumulative functioning time of cp without any reversing cycle or injection defrost.* - *The discharge T>Set_factory(6)-set_factory(5) = default 130°* **And** it is a min. time *set_maintenance(d)* between the end of defrost by 4 way valve and the start of next (default 20') (between two reversing cycle defrosts we can have some defrost by injection if DIP2 is OFF) **If defrost starts for high discharge T° the minimum times about 4 way valve aren't respected. It showed a prealarm but the compressor works. If the defrost starts respecting the minimum time between two reversing cycles no prealarms are showed.** **Now** the reversing cycle defrost is activated

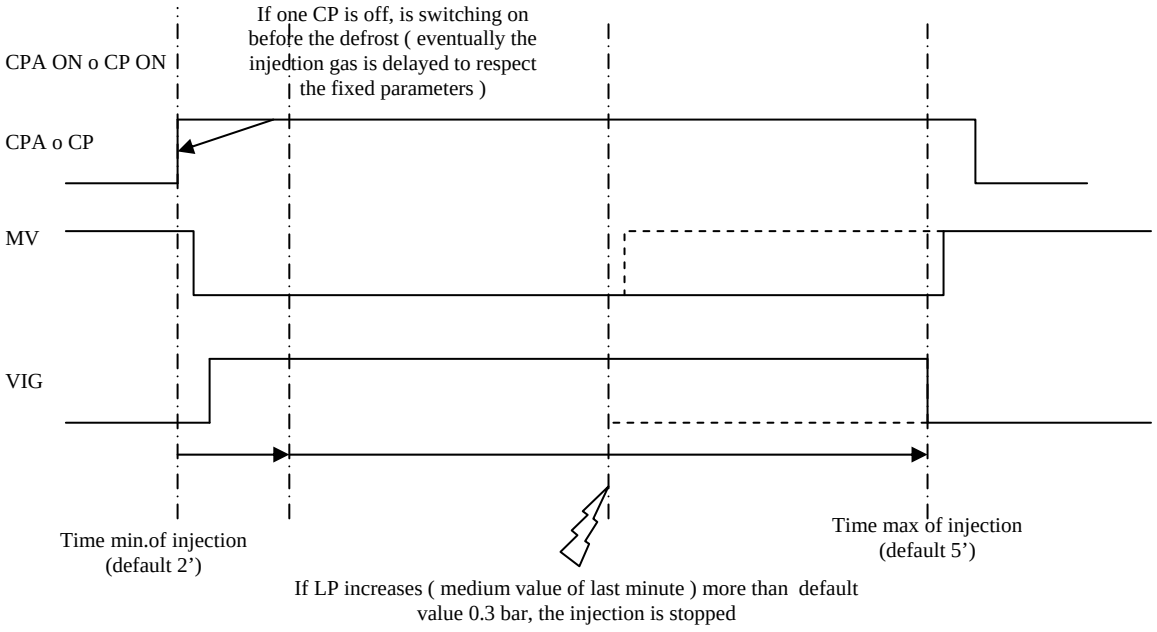
Table 5 – Conditions to enable defrosts by 4 way valve

HOT GAS INJECTION

On pic.24 is showed the loads logic during one injection of hot gas. The injection stops for maximum time of defrost or because the LP pressure (medium value of last minute) arrives to *set_maintenance(3)* (default 0.3 bar), in comparison to LP medium pressure after the minimum injection time.


MV
VIG
Time min. of injection
(set_maintenance(6): default 2')
Time max of injection
(set_maintenance(7): default 5')
If the LP (medium value in the last minute) increases of
set_maintenance(3): default 0.3 bar, the injection stopped
Compressor ON

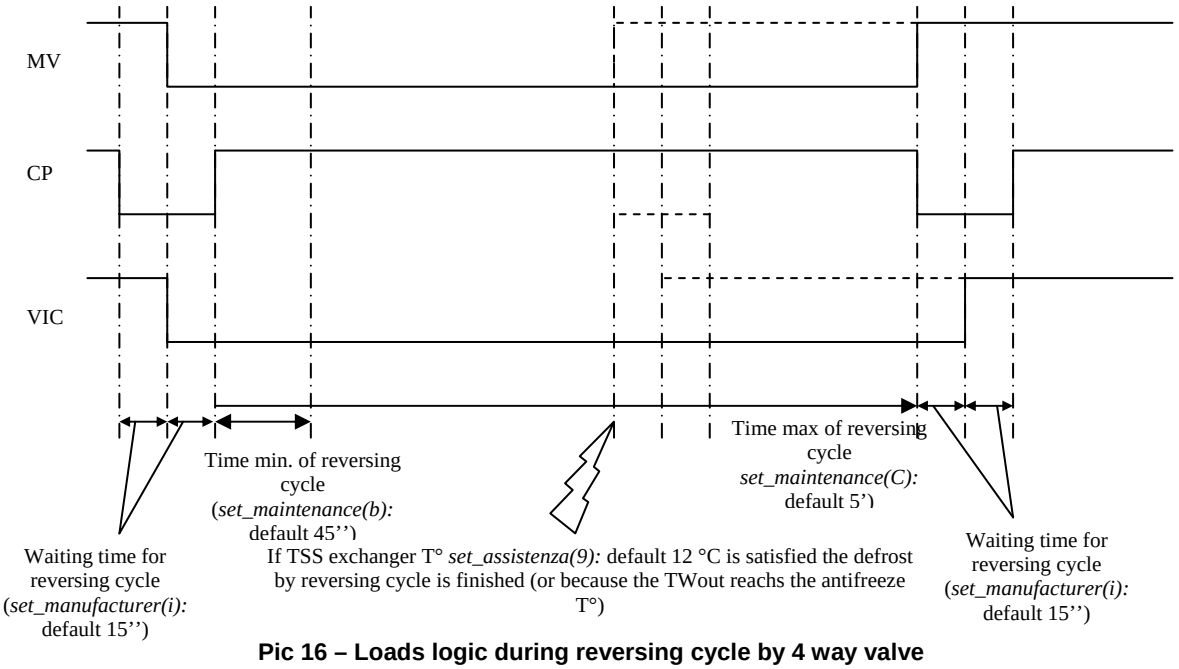
Pic 14 – Loads logic during hot gas injection


If one CP is off, is switching on
before the defrost (eventually the
injection gas is delayed to respect
the fixed parameters)
CPA ON o CP ON
CPA o CP
MV
VIG
Time min.of injection
(default 2')
Time max of injection
(default 5')
If LP increases (medium value of last minute) more than default
value 0.3 bar, the injection is stopped

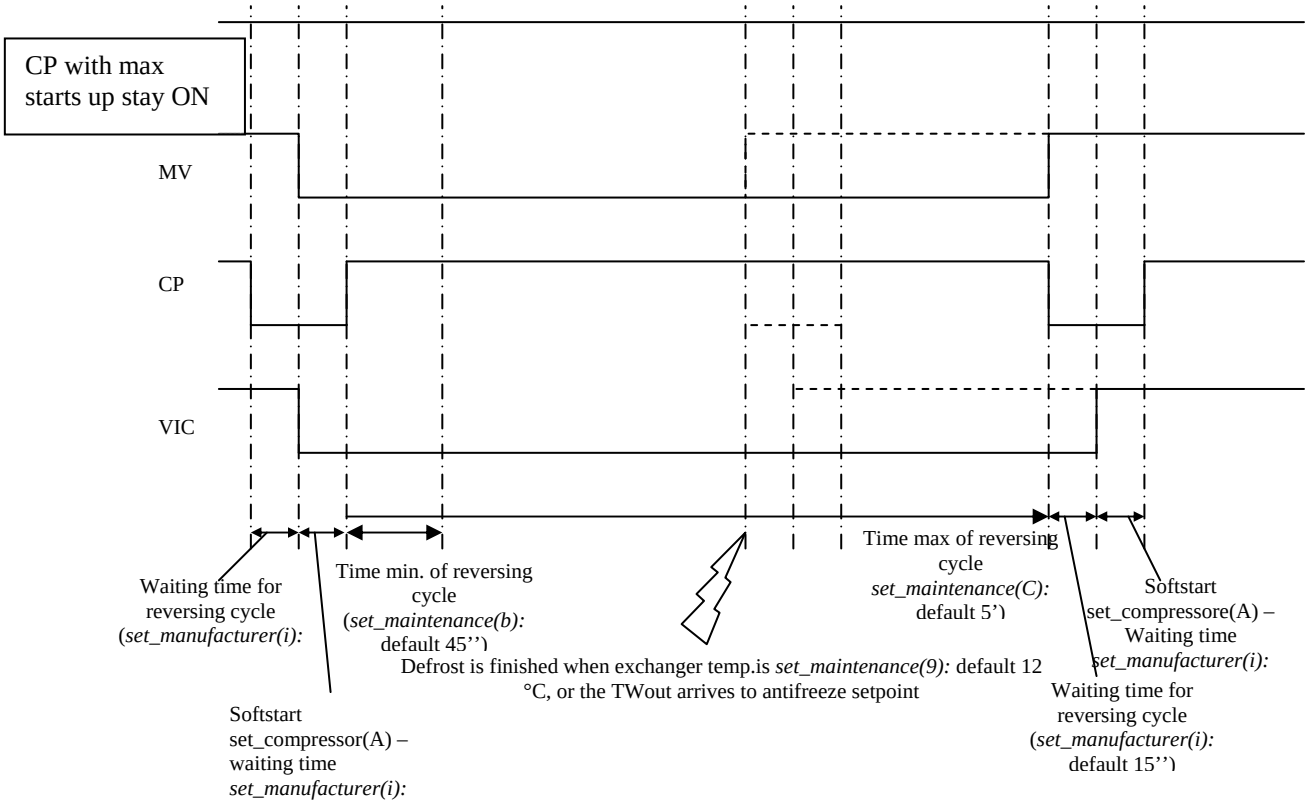
Pic.25 15 – Loads logic about hot gas injection with two compressors

REVERSING CYCLE by 4 way valve

Pic 16 shows the logic about reversing cycle defrost using 4 way valve.
Defrost is finished for max time or according to *set_maintenance(9)* (default 12 °C).


MV
CP
VIC
Time min. of reversing cycle (set_maintenance(b): default 45'')
Time max of reversing cycle set_maintenance(C): default 5')
Waiting time for reversing cycle (set_manufacturer(i): default 15'')
If TSS exchanger T° set_assistenza(9): default 12 °C is satisfied the defrost by reversing cycle is finished (or because the TWout reachs the antifreeze T°)
Waiting time for reversing cycle (set_manufacturer(i): default 15'')

Pic 16 – Loads logic during reversing cycle by 4 way valve


CP with max starts up stay ON
MV
CP
VIC
Waiting time for reversing cycle (set_manufacturer(i):
Time min. of reversing cycle (set_maintenance(b): default 45'')
Time max of reversing cycle set_maintenance(C): default 5')
Softstart set_compressore(A) – Waiting time set_manufacturer(i):
Softstart set_compressor(A) – waiting time set_manufacturer(i):
Defrost is finished when exchanger temp.is set_maintenance(9): default 12 °C, or the TWout arrives to antifreeze setpoint
Waiting time for reversing cycle (set_manufacturer(i): default 15'')

Pic 17 – Loads logic by reversing cycle using 4 way valve with two compressors and softstart

If during the reversing cycle the HP is to set_maintenance(g)(default 30 bar) the fans start. They are stopped when HP is under to set_maintenance(g)-set_maintenance® (default 25 bar)

17 ANL-C motocondensing unit

The motocondensing version ANL-C (dip switch 10 ON) can be done using digital imput / output contact on the modu_control controller:

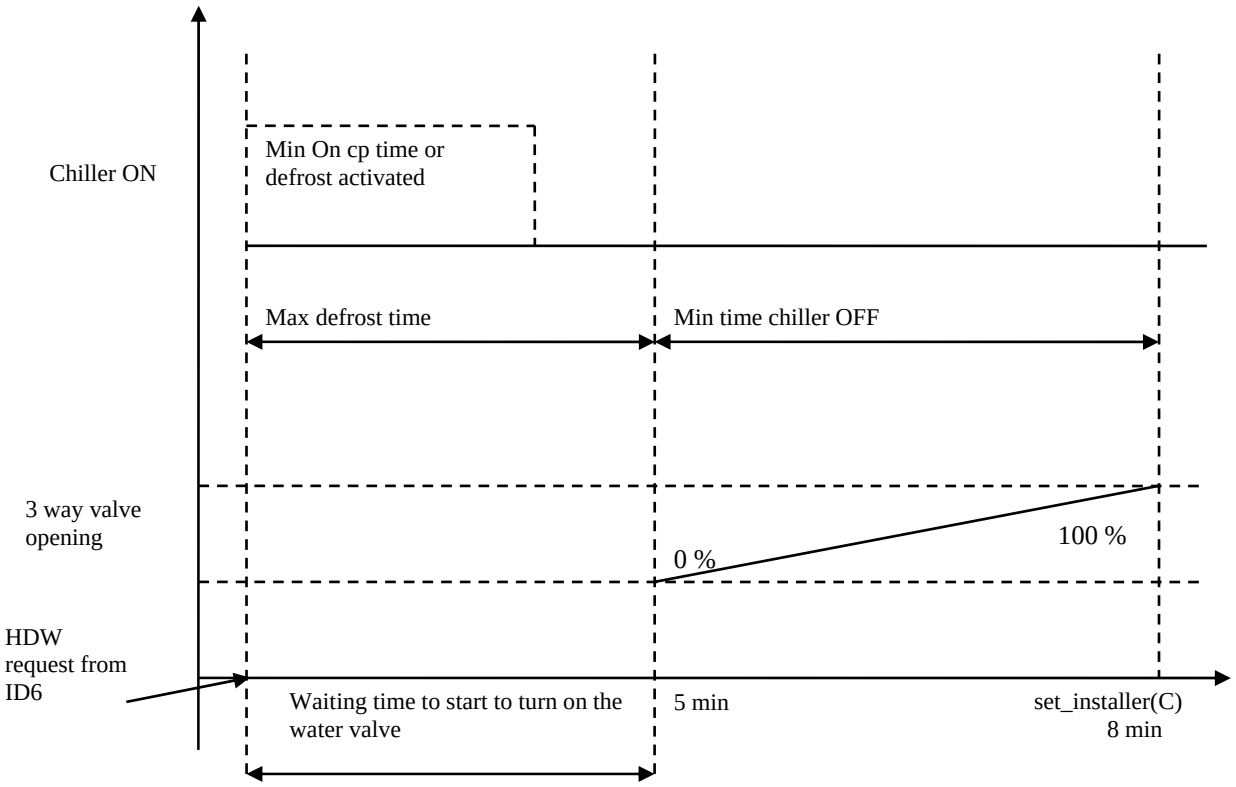
I/O	terminals	Motocondensing version
NTC1 - SIW	M9.1 M9.2	Closed contact : 100% of request
NTC2 - SUW	M9.3 M9.4	Closed contact : antifreeze alarm
NTC3 - SS	M9.5 M9.6	Closed contact : 50% of request
FL	M7.3 M7.4	Open contact: flow switch alarm
Cooling / heating contact		Don't used

The capacity alarm, low water content, sensors failure alarms aren't activated.
The other alarms have standard management.

18 ECS-HDW – hot domestic water management

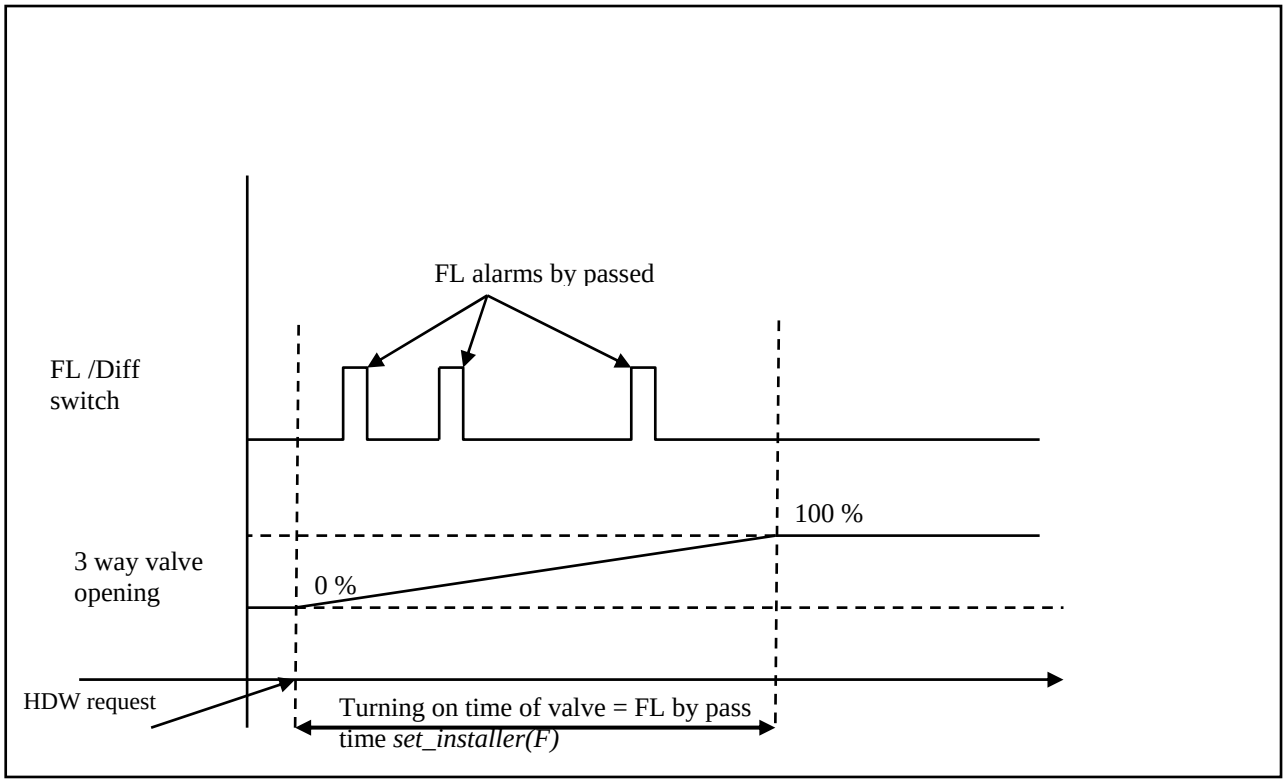
Since version SW 3.7.0 on heat pumps type it is possible to produce hot water for domestic application. The HDW works according to own set point (set_user(e) and differential set_user(f).
The HDW can be enable from parameter set_installer(A) = 1, default activated. The ID6 digital contact manages the hdw demand:
contact closed = HDW ON
contact open = HDW OFF (unit works in functioning selected).
HDW procedure when ID6 becomes closed:

#	Step
1	Start a time about type of 3 way valve (time to turn on HDW system) set_installer©. It is a time to turn on the 3 way valve on the HDW system + max defrost time. Example: Max defrost time per revrsing cycle is 5 min and we need 3 min to turn the valve the total time becomes 8 minutes. THIS DEFAULT TIME IS ZERO AND MUST BE ADJUSTED. See picture 28
2	The uniti is stopped (the minimum working and eventually end of defrost are waited)
3	The step time 1 is waited
4	The heating functioning is activated and unit starts working with HDW set point. During this operation it used like maximum heating capacity available (n° of compressors used) the parameter set_installer(b), default 70%.
5	When the HDW is setpoint is reached, the HDW function is stopped and following the steps 1,2 and 3 the controller back at the standard operation functioning.



Pic 28 – chiller OFF during movement of 3 way valve

If during the movement of 3 way valve FLOW SWITCH alarms come on through a parameter set_installer(E) and a by-pass time set_installer(F) it is possible to avoid and by pass the FL alarm, see picture 29.


FL alarms by passed
FL /Diff switch
100 %
3 way valve opening
0 %
HDW request
Turning on time of valve = FL by pass time set_installer(F)

Pic 18 – FL bypass during 3 way valve movement

In order to use a controller with software version 3.7.0 also in old models we must don't enable the HDW and to use the ID6 like fan circuit braker, parameter set_installer(A) = 0.

19 AMBIENT THERMOSTAT TRA

Since version SW 3.7 is possible to use the ID3 contact like AMBIENT THERMOSTAT. This function can be used to reduce the Energy consumption if the ambient temperature is satisfied.
Setting set_installater(d) the ID3 can be used for:

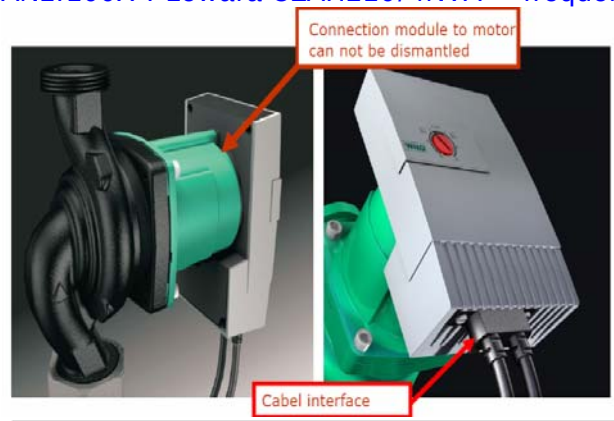
set_installer(d)	ID3 function
0	ID3 don't enable: TRA and circuit braker water pump don't enable.
1	TRA enable. Openig the contact CP and electric heaters OFF. Water pump still working.
2	TRA enable. Opening the contact CP, electric heaters and water pump OFF.
3	TRA OFF and circuit braker water pump alarm activated on ID3. Can be used for replacement of old controller until 3.6.

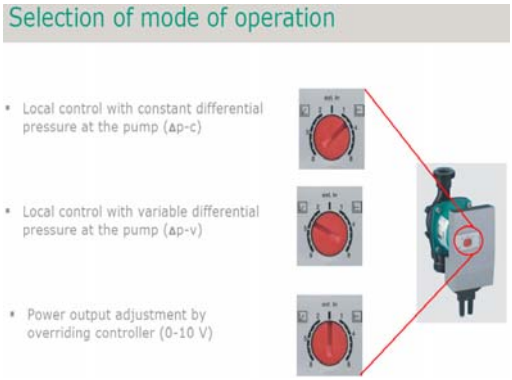
The HDW has always priority on the TRA.
The TRA function is present only on boards with code 3416320 IM00 or 3416370 IM00 or next codes.

20 INVERTER PUMPS

The inverter pump can be used on ANLI units.
The pump management is independent done and through the ID1 the moducontrol can control the pump alarm (it is shared with MTC and MTV).

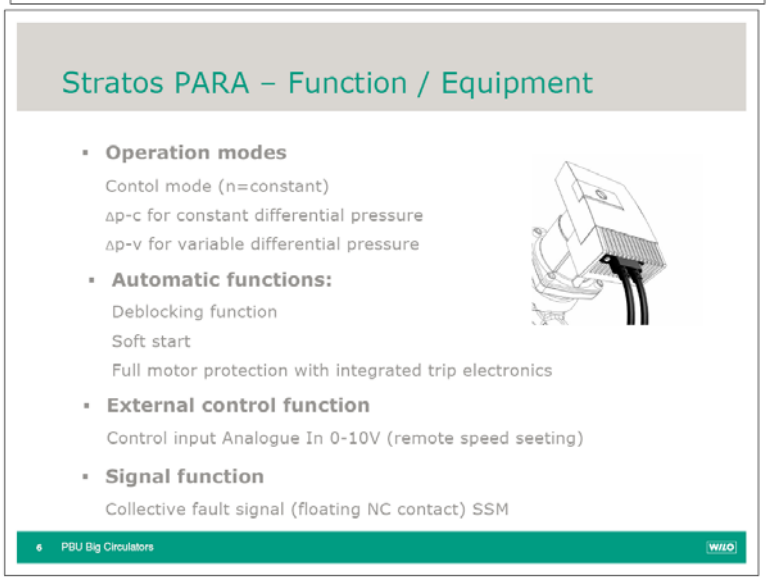
Aermec uses:
ANLI020X : pump type Wilo Stratos Para 25/ 1-8
ANLI070X : pump type Wilo Stratos Para 30/ 1-11
ANLI100X : Lowara CEAH210/4NVA + frequency converter HW4.022




Selection of mode of operation
Local control with constant differential pressure at the pump (Δp-c)
Local control with variable differential pressure at the pump (Δp-v)
Power output adjustment by overriding controller (0-10 V)

Wilo-Stratos PARA
- Especially for OEMs
- Extension of High Efficiency pump range towards lower functionality
- Motor sizes 23 and 33
Main customer: heat pump and A/C manufacturer
Types: Stratos PARA 25(30) /1-11
Stratos PARA 25(30) /1-8
Accessory: 0-10V interface and plug
Delivery Start: July´06 for MS 23
4 PBU Big Circulators
WILO

- **Power supply**
  Voltage: 230V, +/- 10%
  Frequency: 50 Hz
- **Protection class module:**
  IP55
- **Protection class pump:**
  IP44



- **Permitted field of application**

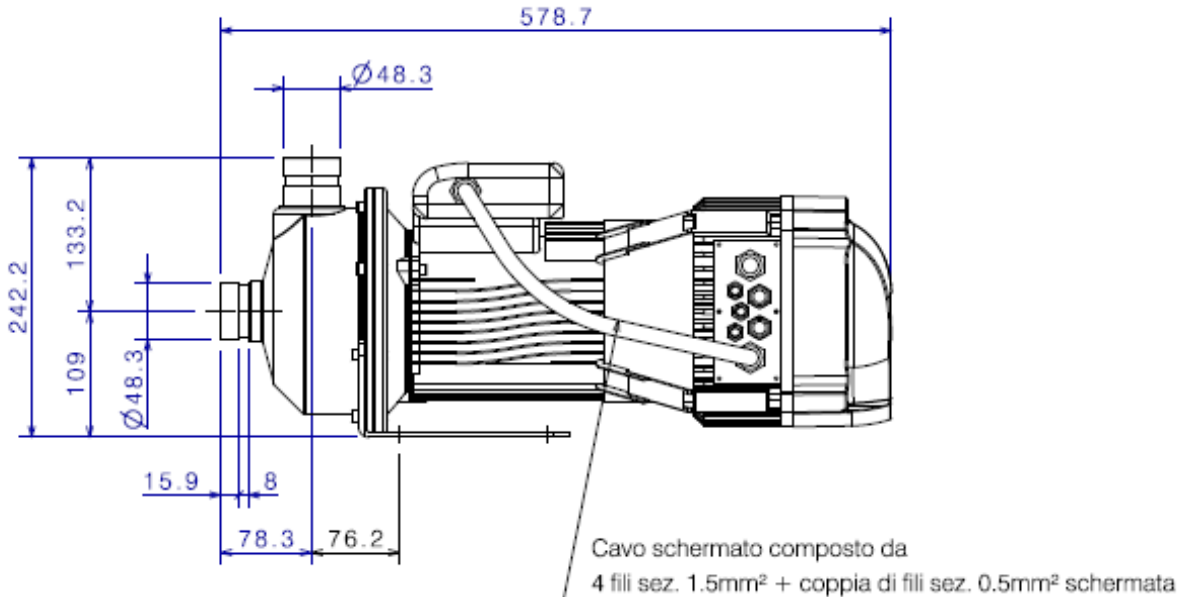
Temperature limits: -10°C up to 110°C

Ambient to Fluid Temperature limits: 50°C / 15°C
40°C / 90°C
<25°C / 110°C

- **Dimensions / Pipe connection**

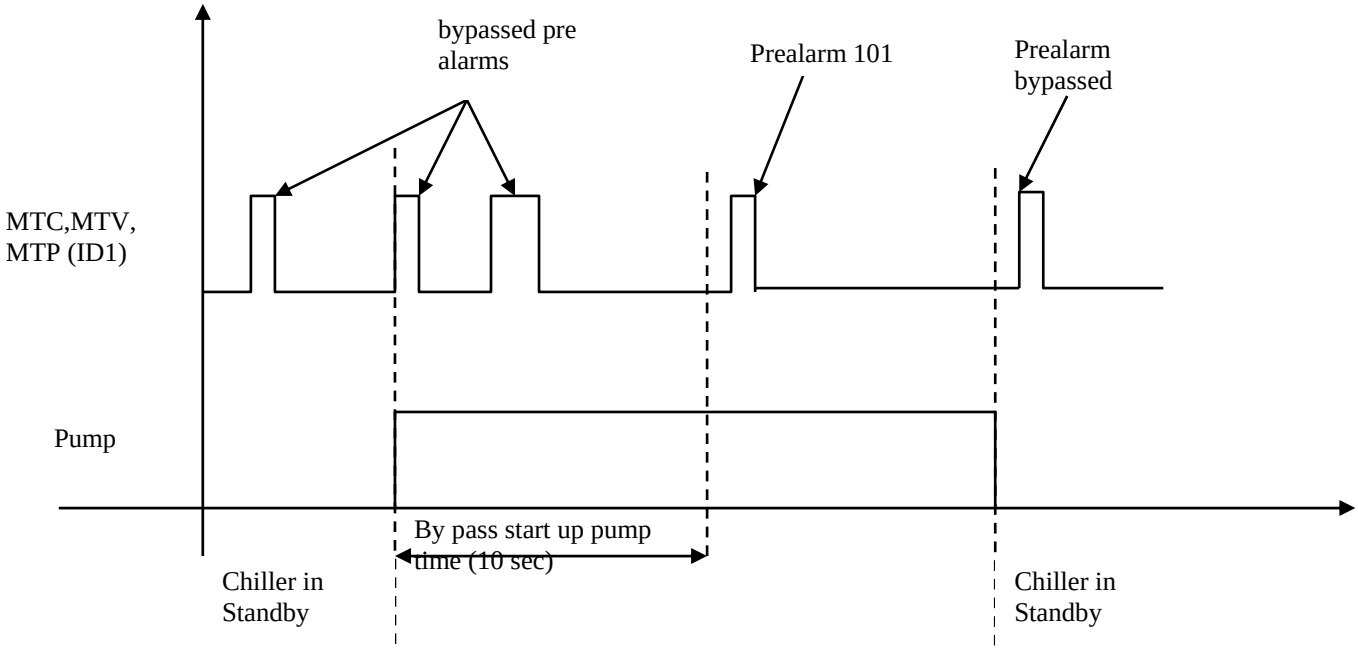
port to port length: 180mm, DN 25 (Rp 1) and DN 30 (Rp 1 ¼)

Lowara CEAH 210/4NVA + Hidrovar HV 4.022



From factory the inverter pump is already setted

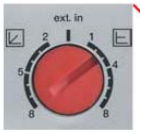
When the chiller is in stand by the ID1 is by passed.
It is also by passed for 10" at the water pump start up.
The pre-alarm 101 (MTC,MTV,MTP) stops the compressor but don't stop pump and fan.
If the pre-alarm arrives from MTC or MTV the unit stops after 60" *set_manufacturer©.* If the pre-alarm arrives from MTP, the pump re-starts automactely until to reach the max number of pre-alarms *set_manufacturer(d).*



bypass pump alarm

ANLI with inverter pump: prescription to minimum water flow rate installation

The inverter pump adjusts the speed automactely. The regulation that we have chosen is Dp constant where the pump works having in the system the same static pressure available.

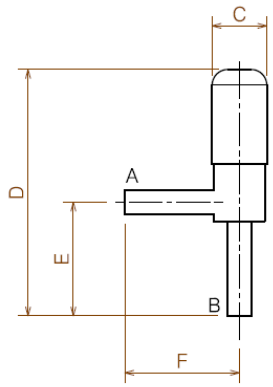


Aermec setting is to have max Dp (on 8 position) the regulation
The lower water flow limit must be the 35% of nominal water flow 12/7 35° C in order to be sure to have enough water flow inside the plate exchanger to avoid bad performance, getting on alarms and risks to frozen the exchanger .
We suggest don't use only 2 way water valve but an enough number of 3 way water valve to garantee the minimum water flow.

21 ELECTRONIC EXPANSION VALVE

ANLI Chillers can be equipped with electronic expansion valve.

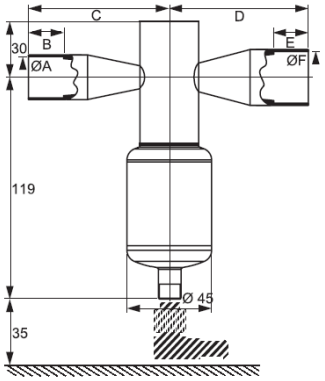
ANLI020 (EXM-BOD) and ANLI070 (EXL-BIF):



CODICE	CODICE FORNITORE	MODELLO	CONNESSIONI A/B	C	D	E	F
5313600	PCM 800401M	EXM-B0D	1/4" x 8 mm	17.3 mm	78 mm	36 mm	36.3 mm
5313601	PCM 800406M	EXL-B1G	1/4" x 8 mm	21.8 mm	90 mm	42 mm	42 mm
5313602		EXL-B1F	1/4" x 8 mm	21.8 mm	90 mm	42 mm	42 mm

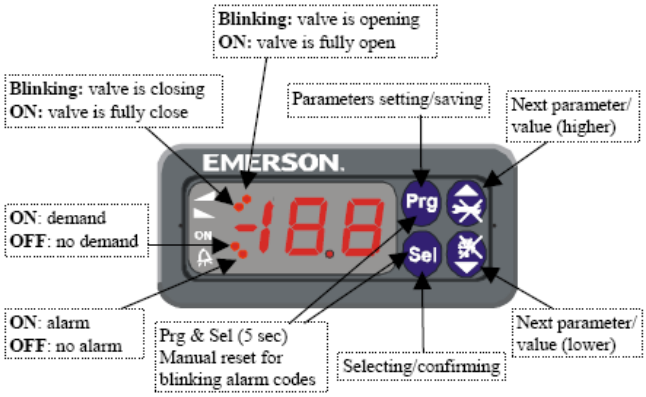
ANLI100:

TIPO	ΦA x ΦF (ODF)	B	C	D	E
EX5-U31	22 x 22 mm	16	65	65	16



Regulation 10 to 100%
Steps number 1600

ECD-002 display/keypad unit (LEDs and button functions)



Setup of main parameters (need to be checked/modified before start-up) using ECD-002

- Make sure that digital input is 0V (open). Turn the power supply ON.

Important: Three main parameters i.e. refrigerant type (u0), pressure sensor type (uP) and valve type (ut) can be set only when digital input is open (0V) while the power supply is ON (24V). This feature is for added safety to prevent accidental damage of compressors and other system components.

- For easy setting of main parameters, follow the pictorial procedure of **"Quick start-up"** on the attached individual paper.

Once the main parameters have been selected/saved the EC3 is ready for startup. All other parameters can be modified at any time during operation or standby if it is necessary.

Start-up

Start the system and check the superheat and operating conditions.
The EC3-X33/53 is fully functional without keypad/display unit. ECD-002 may be removed or connected at any time.

Procedure for parameters modification using ECD-002

The parameters can be accessed via the 4-button keypad. The configuration parameters are protected by a numerical password. The default password is "12".
To select the parameter configuration:

Press the **PRG** button for more than 5 seconds
A flashing 0 is displayed
Press ▲ or ▼ until 12 is displayed; (password)
Press **SEL** to confirm password
Press ▲ or ▼ to show the code of the parameter that has to be changed;
Press **SEL** to display the selected parameter value;
Press ▲ or ▼ to increase or decrease the value;
Press **SEL** to temporarily confirm the new value and display its code;
Repeat the procedure from the beginning *"press ▲ or ▼ to show..."*

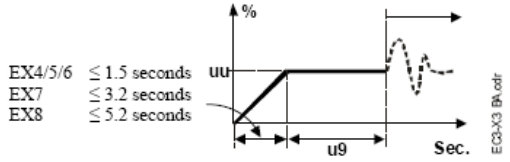
To exit and save the new settings:
Press **PRG** to confirm the new values and exit the parameters modification procedure.

To exit without modifying any parameters:
Do not press any button for at least 60 seconds (TIME OUT).

Reset all parameters to factory setting:

- Make shure that digital input is 0V (open).
- Press ▲ and ▼ together for more than 5 seconds.
- A flashing 0 is displayed.
- Press ▲ or ▼ until the password is displayed (Factory setting = 12).
  If password was changed, select the new password.
- Press SEL to confirm password
- "0" is displayed.
- Press SEL to reset all parameters to factory setting
- Press PRG to activate the function and leave the special function mode.

Control (valve) start-up behaviour (Parameter uu and u9)



Main parameters (must be checked and modified if necessary)

Code	Parameter description and choices	Min	Max	Factory setting	Field setting
H5	Password	1	199	12	
u0	System refrigerant 0 = R22 1 = R134a 2 = R507 3 = R404A 4 = R407C 5 = R410A 6 = R124 7 = R744 (subcritical application)	0	7	1	
uP	Installed pressure sensor type 0 = PT4-07S (for R22/R134a/R507/R404A/R407C/R124) 1 = PT4-18S (for R410A) 2 = PT4-30S (for R744, subcritical)	0	1	0	
ut	Installed valve type 1 = EX4 2 = EX5 3 = EX6 4 = EX7 5 = EX8	1	5	5	

Optional parameters
(recommended factory setting for majority of applications)

uu	Start valve opening (%)	10	100	50	
u9	Start opening duration (second)	1	30	5	
uL	Low superheat alarm function 0 = disable (for flooded evaporator) 1 = enable auto reset 2 = enable manual reset Cut-out at 0.5K (if it maintains 1 min.); Cut-in immediately at 3K	0	2	1	
u5	Superheat set-point (K) If uL enabled (auto or manual) If uL disabled	3 0.5	30 30	6 6	
u2	MOP function 0 = disable 1 = enable	0	1	1	
u3	MOP set-point (°C) saturation temperature Factory setting is according to selected refrigerant (u0): +13°C for R22 +15°C for R134a +7°C for R507 +7°C for R404A +15°C for R407C +15°C for R410A +50°C for R124 -5°C for R744	*	*	X	
┌┘5	Units conversion (only for u3, u5, ┌┘1) 0 = °C, K, bar 1 = °F, R, psig (Psig values are divided by 10. Example: Display 12.5 is 125 psig)	0	1	0	
┌┘1	Value to show 0 = Measured superheat (K) 1 = Measured evaporating pressure, (bar); 2 = Valve opening (%) 3 = Measured coil-out temperature (°C) 4 = Calculated evaporating temperature (°C) from the pressure	0	4	0	
b1	Battery error management, when battery is defective (EC3-X33 only), see below:	0	3	2	

value	Alarm display	Alarm relay	Valve	Reset possibility after recovery/replacement
0	-	-	Regulating	-
1	Ab	-	Regulating	-
2	Ab	Signalling	Fully close	Auto
3	Ab (blinking)	Signalling	Fully close	Manual

*) Min. and Max. setting values are dependant to selected type of refrigerant.

Mounting of ECD-002

ECD-002 can be installed at any time also during operation.

- ECD-002 can be mounted in panels with 71x29 mm cutout
- Push controller into panel cut-out.(1)
- Make sure that mounting lugs are flush with outside of controller housing
- Insert allen key into front panel holes and turn clockwise. Mounting lugs will turn and gradually move towards panel (2)
- Turn allen key until mounting lug barely touches panel. Then move other mounting lug to the same position (3)
- Tighten both sides very carefully until keypad is secured. Do not over tighten as mounting lugs will break easily.

Error/Alarm handling

Alarm code	Description	Related parameter	Alarm relay	Valve	What to do?	Requires manual reset after resolving alarm
E0	Pressure transmitter error	-	Signalling	Fully close	Check wiring connection and measure the signal 4 to 20 mA	No
E1	Temperature sensor error	-	Signalling	Fully close	Check wiring connection and measure the resistance of sensor	No
AI1	EX4…EX8 electrical connection error	-	Signalling	-	Check wiring connection and measure the resistance of winding	No
AL	Low superheat	uL: 1	Signalling	Fully close	Check wiring connection and operation of valve	No
AL blinking	(<0,5K)	uL: 2	Signalling	Fully close		Yes
Ab	Battery error	b1: 1	-	Regulating	Battery potentially does not have enough charge to close valve in case of main power supply interruption. May occur temporarily with new controllers or after long storage but should disappear when battery is charged sufficiently. If Ab remains active even when battery is charged, battery may be defective and should be replaced. (Replacement kit: 807 790).	-
Ab		b1: 2	Signalling	Fully close		-
Ab blinking		b1: 3	Signalling	Fully close		Yes
Er	Data error display - out of range	-	-	-	Data send to the display is out of range. Check temperature and pressure sensor.	No

Note: When multiple alarms occur, the highest priority alarm is displayed until being cleared, then the next highest alarm is displayed until all alarms are cleared. Only then will parameters be shown again.

Message

--- **No data to display**
The display will show an "---" at start up and when no data is send to ECD-002

Checking system operating conditions

The data to be permanently shown on the display can be selected by the user (parameter ┌┘1). It is possible to temporarily display other values. However this function is not available in an alarm condition. The display will show for one second the numerical identifier of the data (see ┌┘1 parameter) and then the selected data. After 5 minutes, the display will return to the by parameter ┌┘1 selected data.

Service / Troubleshooting

Symptom	Cause	Action
Operating superheat is several degrees higher or lower than set-point	Incorrect signal from pressure or temperature sensors	1- Check the sensors 2- Make sure ECN-N60 temperature sensor is used 3- For optimum accuracy, please use: PT4-07S for R22/R134a/R507/R404A/R407C/R124 PT4-18S for R410A PT4-30S for R744 4- Make sure the sensor cables are not installed along with other high voltage cables
Operating superheat is too low i.e. compressor wet running	1- Incorrect wiring of ECVs 2- Defective sensors	1- Check the wiring 2- Check the sensor
Valve is not fully closed	1- The digital input is ON (24V) 2- Wrong setting of parameter ut.	1- Valve is shut off only when the digital input is turned off (0V) 2- Check the setting of parameter ut
Instable superheat (hunting)	Evaporator is designed to operate at higher superheat	Increase the superheat set-point
Valve opens when EC3 commands to close and vice versa	Wrong wiring between EC3-X33 and valve	Correct the wiring
EX8 is not able to open at high differential pressure	Wrong setting of parameter ut	Check the parameter ut. (Larger valve requires higher torque and higher current)
Superheat set-point is shifting after several months of uninterrupted operation or permanent jumper of 24V digital input	Stepper motor driven valves require synchronization	Do not apply permanent 24V digital input. Interrupt digital input once every week for 5 seconds if compressor never stops.

22 ECONOMIZER

Since 3.9 version is managed the economizer (SRP). To activate the economizer solenoid valve is used output D/A 2 (terminal M6.1-M6.2) controlling with 6V a relay.

The logici is:

- Off in stand-by
- Off in cooling mode
- Off in IC
- Off when HDW is activated if T°air > 22°. Comes on when T°air < 20°
- On after 30” compressor start up
- Off when air sensori s broken

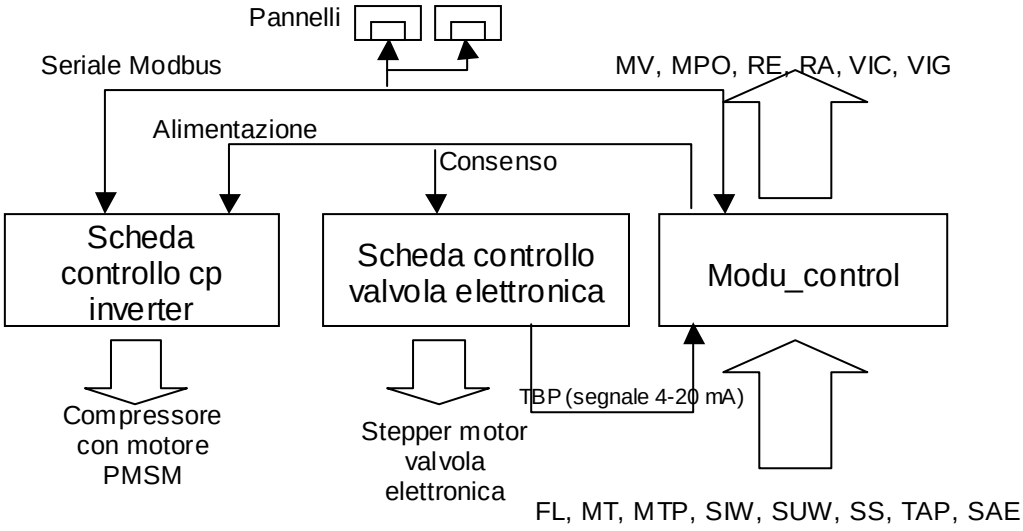
23 Injection liquid valve

Since 3.9 version is managed the injection liquid valve.
The valve logic is activated when safety partialization aren’t enable (dip 5=ON), are activated defrosts by 4 way valve (dip2 = ON) and chiller is type ON/OFF (dip 9 = ON).
The valve is activated when discharge t°> 120°. The differential to stop the valve is 10° (off <110°).

24 ANLI – INVERTER UNIT

Having the dip switch 9 in ON position the moducontrol can control an inverter compressor.
Having inverter capacity regulation are not enable the capacity alarm and low water volume content.

Diagram of logic control

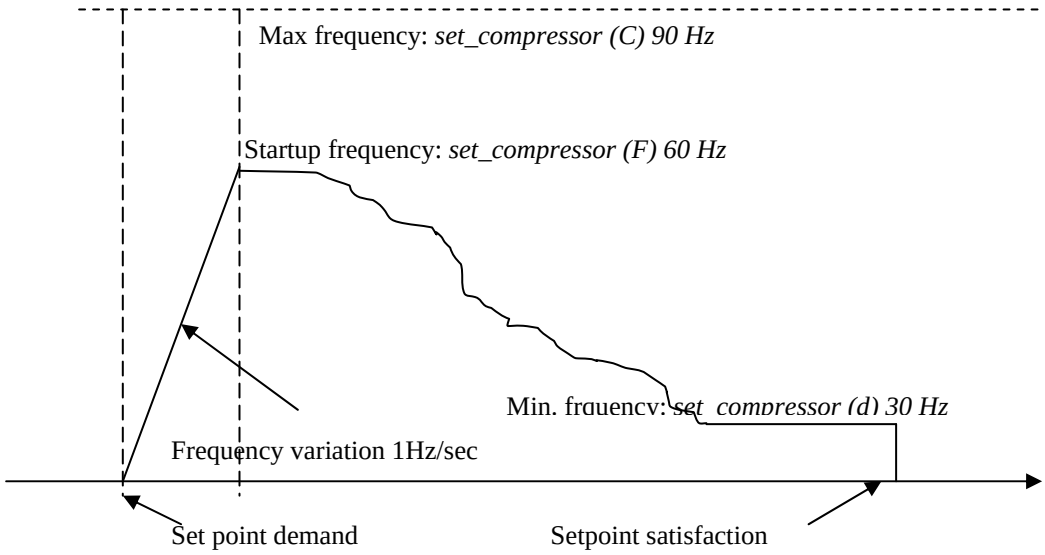


Pic 19 ANLI logic management

The modu_control manages the inverter compressor via serial modbus line (it is the same used for the user panel) that sends the frequency of functioning (in Hertz) to compressor control board.

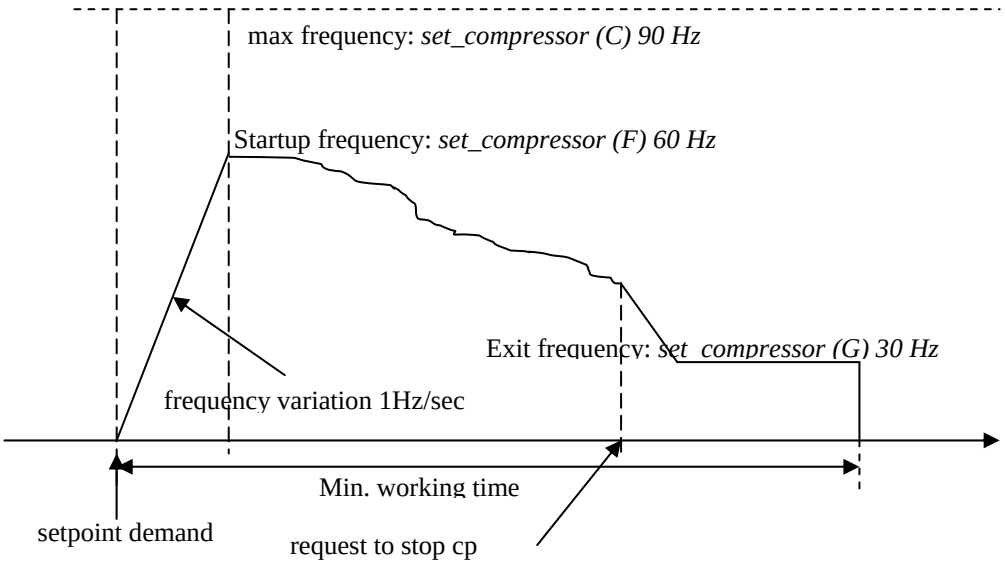
Inverter compressor controls

The compressor management must follow the minimum safety rules that manufacturers request. The minimum working / stopping times are the same standard times used for other compressors.


Max frequency: *set_compressor (C) 90 Hz*
Startup frequency: *set_compressor (F) 60 Hz*
Min. frquency: *set_compressor (d) 30 Hz*
Frequency variation 1Hz/sec
Set point demand
Setpoint satisfaction

Pic 20 – Inverter compressor functioning

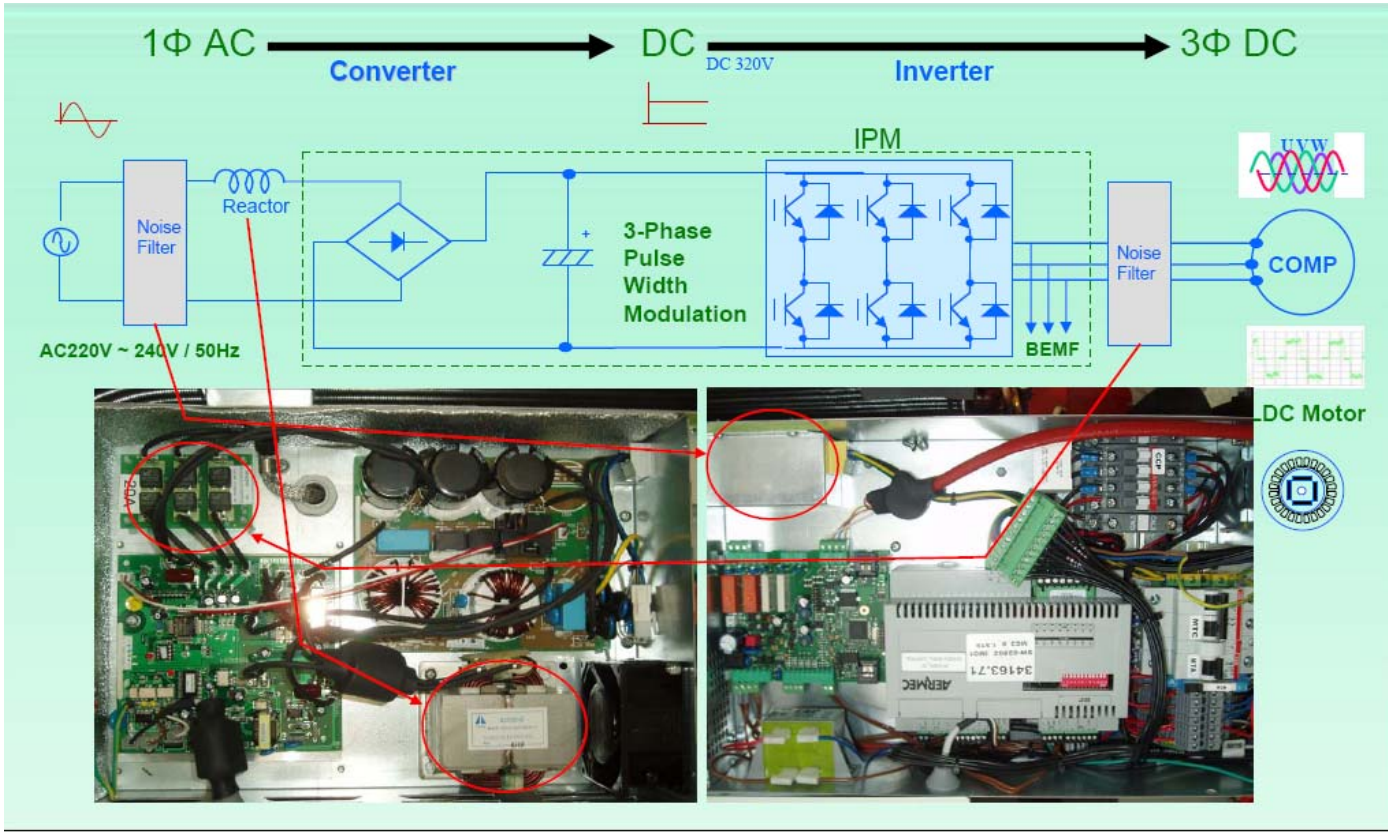
The compressor works inside a range of minimum / maximum having a start up frequency. If we force the stopping of compressor, before to be stopped the compressor reachs an exit frequency *set_compressor(G):* 30 Hz for a shutdown time *set_compressor*(q) 20 sec, or for the rest of minimum working time.
See picture 22

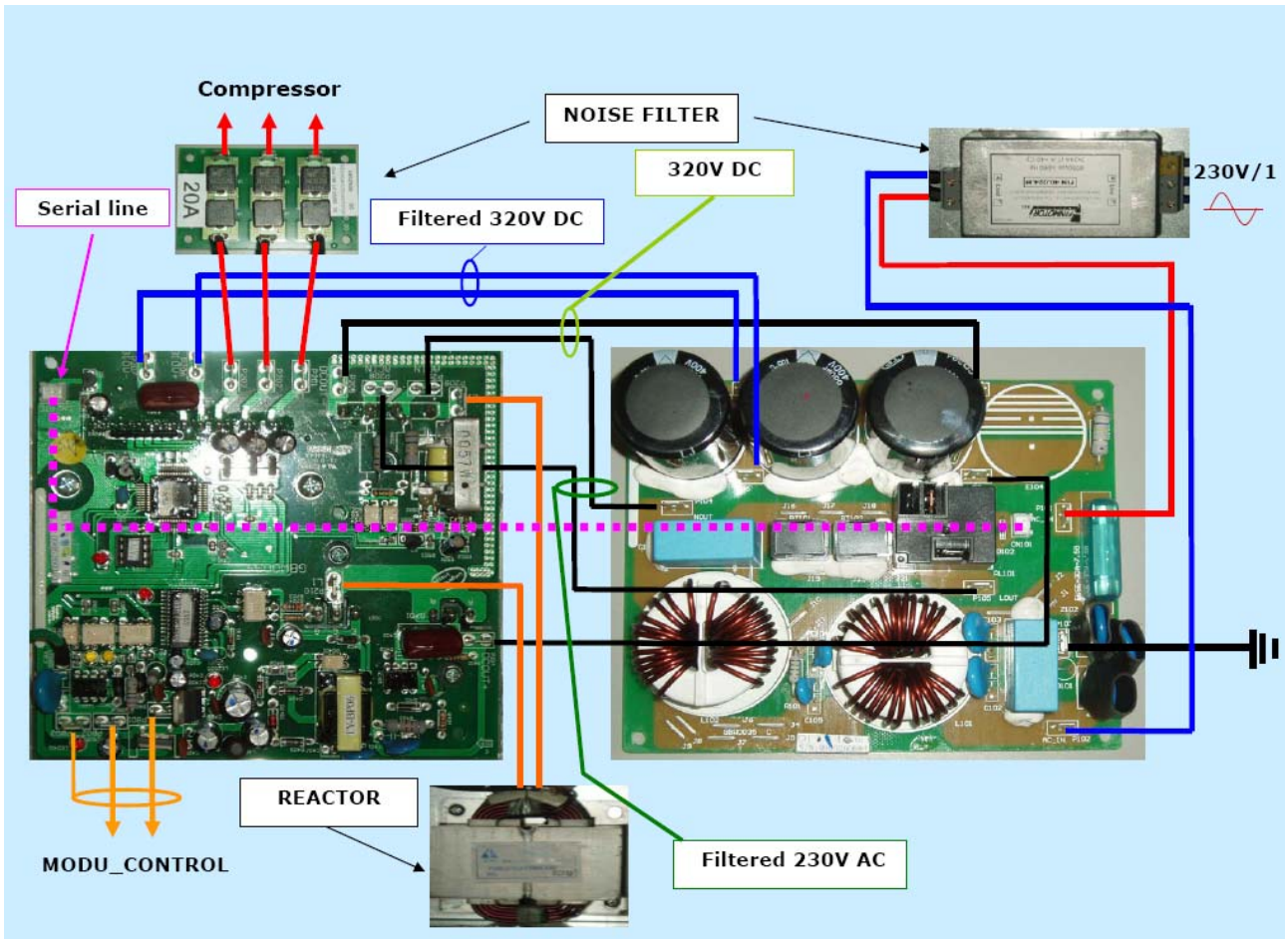

max frequency: *set_compressor (C) 90 Hz*
Startup frequency: *set_compressor (F) 60 Hz*
Exit frequency: *set_compressor (G) 30 Hz*
frequency variation 1Hz/sec
Min. working time
setpoint demand
request to stop cp

Pic 21 – Standard working mode for setpoint demand

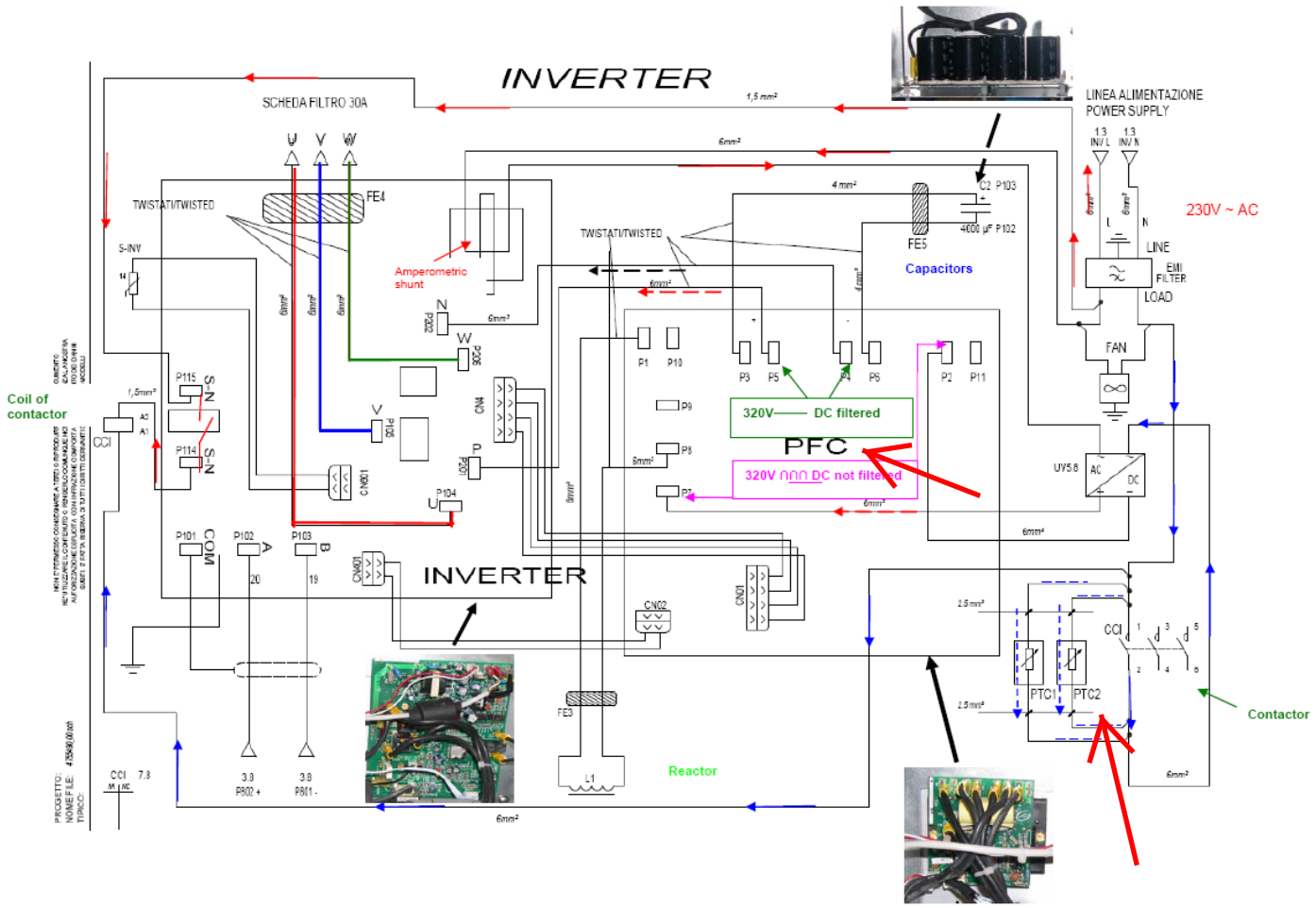
ANL inverter	**020**	**070**	**100**	**200**
Cooling capacity	**6 kW**	**14 kW**	**25 kW**	**40 kW**
Compressor model	Scroll inverter	Twin Rotary inverter	Scroll inverter	Scroll inverter + ON/OFF
Compressor brand	Panasonic	Panasonic	**MITSUBISHI**	**MITSUBISHI**
Frequency [Hz]	30-90	30-62	60-360	60-360

ANLI020 AC – DC CONVERTER



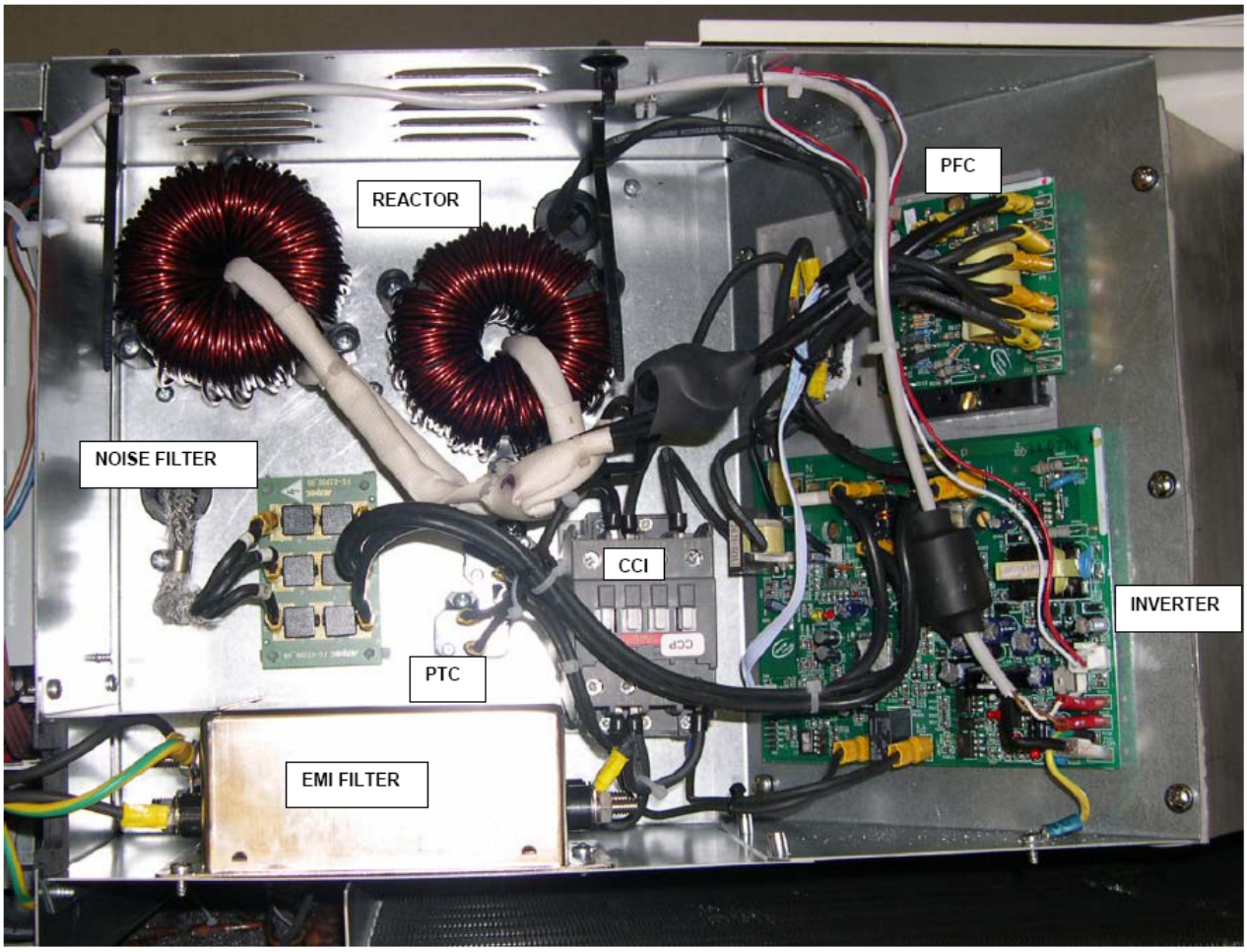


ANLI070

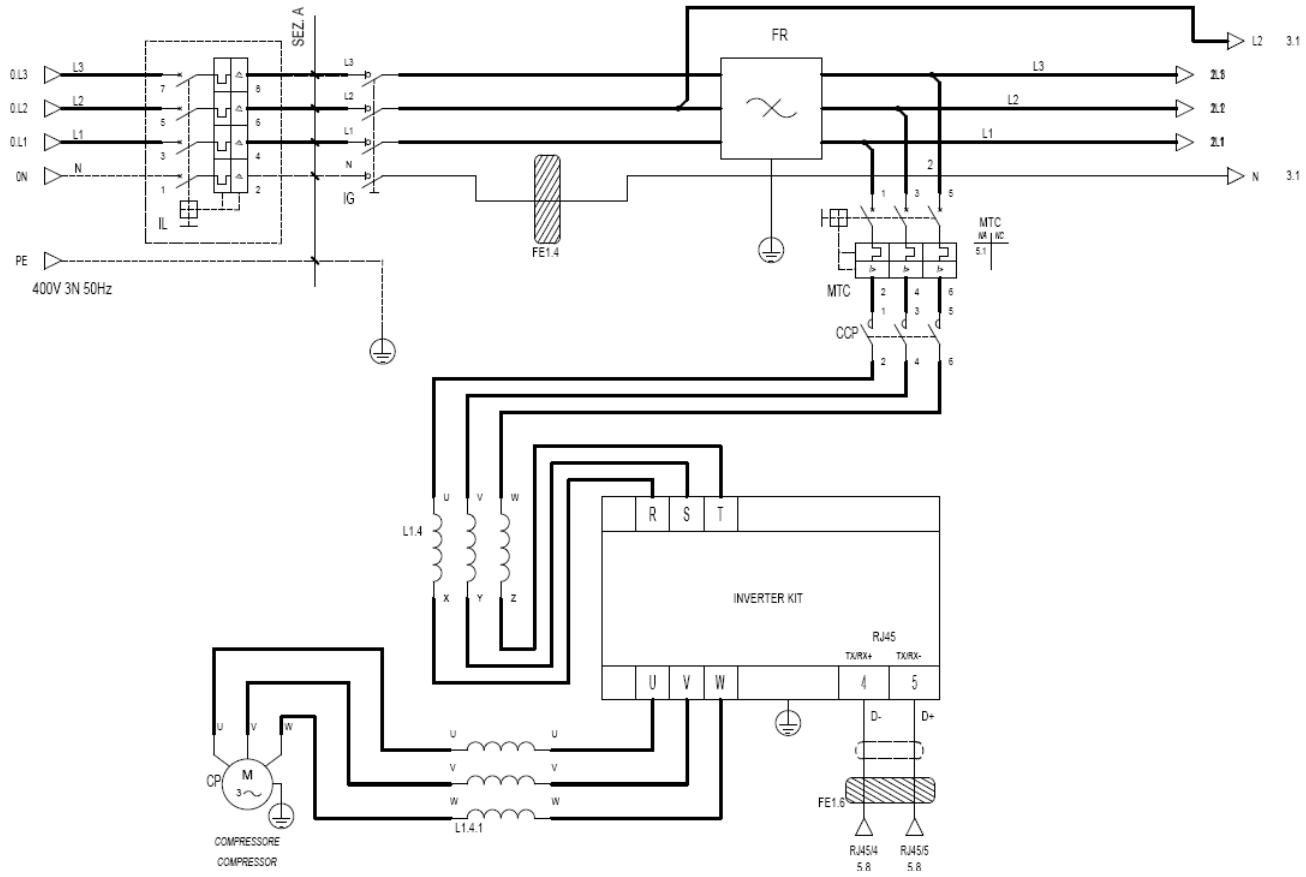


On U-V-W output : only by Oscilloscope (voltage created by IGBT inverter) voltages can be measured.

ANLI070 electric inverter box



ANLI100

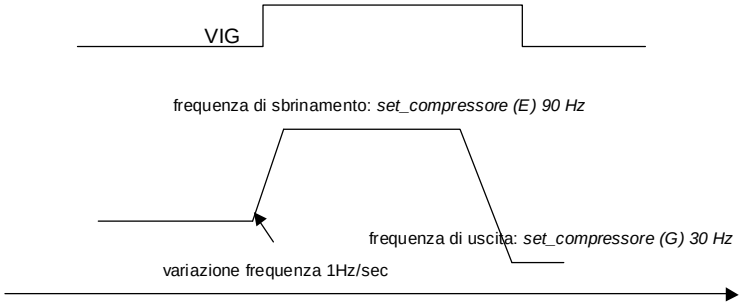


The inverter APY box is a “close box” that can’t be opened to lose the warranty.

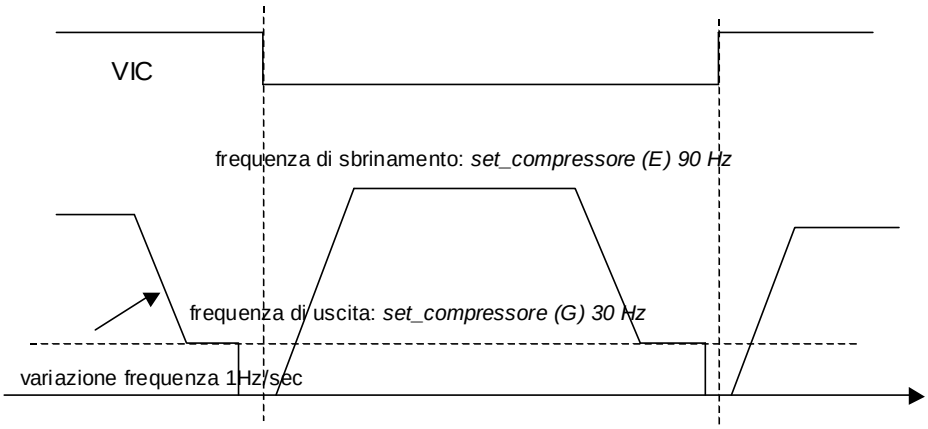
Only the voltages can be measured:
On R-S-T input : 3 x 400 Vac
On U-V-W output : only by Oscilloscope (voltage created by IGBT inverter)

25 ANLI DEFROST

Defrost is enable when the exchanger temperature is lower a parameter *set_maintenance(1)* normally to –2 °C, under a determinate ambient temperature, parameter *set_maintenance(0)* default = 10°C, called "**icing working time"** = working time to enable a defrost under fixed parameters.
The value of **icing working time** to enable a defrost depends from a minimum value *set_compressor(i)* default 10', and a maximum value *set_compressore(J)* default 45'.
If the end of defrost called will be for correct LP the **icing working time** will be increate according parameter *set_compressor(L)* default 5', (until max value).
Every time that the end of defrost is for maximum time reached the **icing working time** will be reduced according parameter *set_compressor(L)* default 5' (until max value). After a numbers of defrosts end by hot injection gas according to parameter *set_maintenance(8)* default 3, the next defrost will be done via reversing cycle after a "**icing working time"**= *set_compressor(N)* default 15'.
If the LP is under parameter *set_maintenance(t)* and if the TGP discharge temperature according to parameter *set_maintenance(u)* it is also under this setting we haven't any hot gas injections but they are substituted by defrosts using only the 4 way valve.
In this case the controller modu_control uses like minimum / maximum time between two defrosts the parameters *set_maintenance(d)* default 20', and *set_compressor(J)* default 45'.
If the end of defrost is done by right temperature sensor on the air exchanger *set_maintenance(9),* the next " **icing working time"** will be increased by parameter *set_compressor(L),* default 5'.
Every time that the end of defrost is done by maximum time the next "**icing working time"** will be reduced the double of parameter *set_compressor(L)* default 5' (until the minimum time).
A defrost by reversing cycle can be done also from parameter *set_maintenance(A)* LP = 2.8 bar with gas R410A.
Defrost diagram.


VIG
frequenza di sbrinamento: set_compressore (E) 90 Hz
frequenza di uscita: set_compressore (G) 30 Hz
variazione frequenza 1Hz/sec

Pic 22 – Example of defrost by hot gas injection


VIC
frequenza di sbrinamento: set_compressore (E) 90 Hz
frequenza di uscita: set_compressore (G) 30 Hz
variazione frequenza 1Hz/sec

Pic. 23 – Example of defrost by reversing cycle

The reversing cycle defrost can finish for maximum time or right temperature on the exchanger.

26 ANLI LIMITS (high pressure / ratio) SW3.9

Operation limits of software logic:

Model	Frequence max	Pressure max (bar)	Pressure Ratio max
ANLI20	90	*Set_compressor_2(2)*=39.9	8.0
ANLI70	62	*Set_compressor_2(2)*=39.9	8.0
ANLI100	120	*Set_compressor_2(2)*=39.9	No

Table 6 – Operation limits

Every intervention of that, the modu_control reduces the frequence according to *set_compressore_2(1),* it waits 60'' and if it is necessary it reduces again the frequence using same step. When system goes out from the limit protection, modu conrol waits 5' and it increases the frequence of *set_compressore(1)/2* . Then every 5', if there aren't limit intervention the frequence is increate of *set_compressore(1)/2* until to arrive at the thermostat demand or max value.

Since SW version 3.9 a intervention of chiller partialization doesn't give a pre-alarm.

HIGH PRESSURE CONTROL (until SW3.75)

Operation limit table of software logic regulation:

Frequency (Hz)	Max HP (bar)	Max compression ratio
<=19	39.9	8.0
<=29	39.9	8.0
<=35	39.9	8.0
<=39	39.9	8.0
<=89	39.9	8.0
<=95	39.9	8.0
<=100	39.9	8.0

Table 7

In case there is an alarm high pressure, maximum compression ratio or high discarge temperature the controller automactely reduces the demand of frequency of 10 Hz **and shows an an pre-alarm code 118, 119 or 120**.
After that it waits 30'' if the critical conditions of working still present the controller reduces again the frequency (other 10 HZ).
If the working parameters are correct after the reduction of frequency, the controller waits 5 minutes and then increases the frequency of 5 Hz.
Then every 5' if there aren't any HP, HDT or ratio pre-alarm the frequency is increasing of 5 Hz to arrive at the frequency value requested or at the maximum frequency value.

27 UNIT WORKING PROCEDURE CONTROL

Inside the logic control there are of course all a series of conditions/parameters to protect the unit from bad functioning.

27a Capacity control and alignment of sensor readings

Giving power supplì to the unit at the first start up the water pump works for 3', then it is measured T_{offset}= TUA – TIA.
Compressor starts and after a time t_{test} (*set_factory(G),* default 1') is calculated ΔT_{cp} = TUA(t_{test}) – TIA(t_{test}) - T_{offset}.
This time must be:

In cooling: $\Delta T_{cp} < - \Delta T_{min}$ (*set_factory(F)* default 1.0 °C)
In heating: $\Delta T_{cp} > \Delta T_{min}$ (*set_factory(F)* default 1.0 °C)

This control is done to identif during the installation whether they have been done sequency phases or sensors errors.

This control can be by-passed setting the dip switch 4 in ON.

27b Preventive water pump start to antifreeze control

The water pump works for 40'' before to start any working procedure without consider the FL alarm.
The digital output antifreeze heater (RA) it used only to control antifreeze heater, and don't as electric heater for heating.

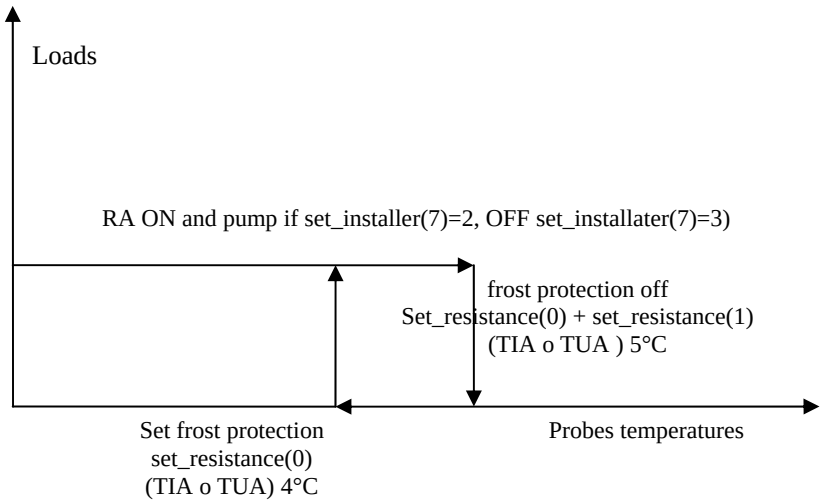
Actually the alarm status blocked the start of all the loads like antifreeze electric heater.

The manage of antifreeze electric heater can be decided from:

- RA ON only with unit in operation, *set_installer(7) = 1*
- RA ON also with unit in standby and alarm activated with water pump in operation (the pump is OFF when the alarm is MTP or FL/PD, *set_installer(7) = 2*
- RA ON also with unit in standby and alarm activated but water pump OFF *set_installer(7) = 3*

When the frost protection is activated (*set_installer(7),* different of 0), because one of water sensors reads a temperature under the parameter limit frost protection *set_resistence(0)* default 4 °C the pump starts (only with *set_installer(7) = 2)* together to the RA (on display the cooling symbol flashing).
When both the water sensors have a temperature above differential parameter *set_resistence(0)* + *set_resistence(1)* the frost protection control is stopped.
The RA is controlled only when (*set_installer(7)* > 0), and activated during standard working mode if *set_installer(7) = 1,* or in standby also having *set_installer(7) > 1*.

BOILER ENABLED:
When boiler is activated in replacement mode (Cp and water pump OFF, boiler ON),the alarm "high water in T°" stays enabled.
Considering antifreeze electric heater and water pump activated if Tair<4°C we suppose that before high temp alarm setted at 64°C antifreeze cycle is desactivated so the uni twill be protected from boiler warm water temperature.



Pic. 24 – Antifreeze control in standby (set_installer(7) > 1)

When we have additional electric heaters and storage tank the pump works in parallel with resi stance.
PS: there isn't any water sensor that controls the tank temperature.

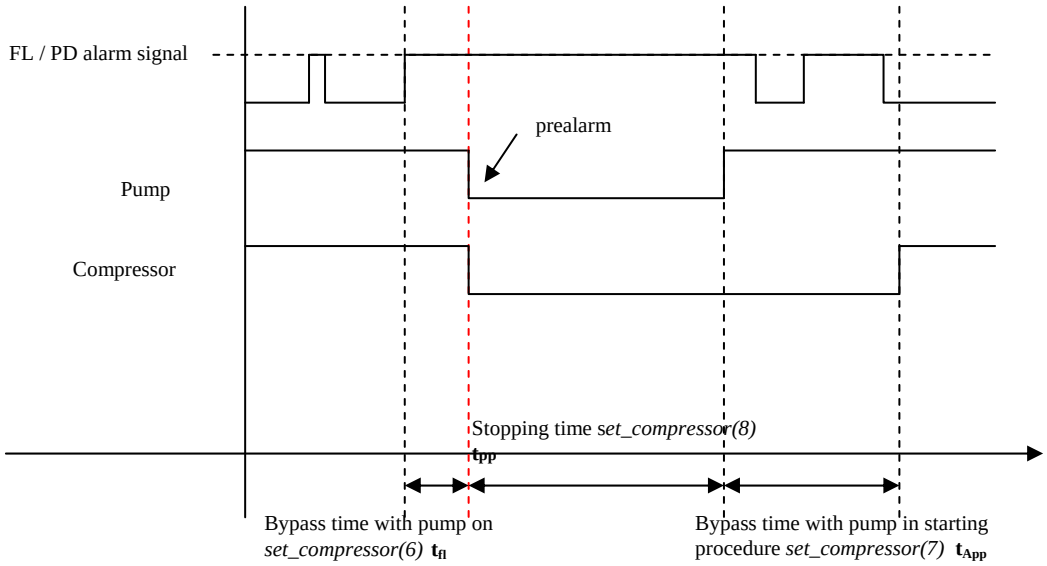
27c Flowswitch/differential pressostat (fl/pd)

The FL it isn't more a primary alarm (it was on old board version 3416310) and the stop of unit will not so istantaneous.
Can be delated with a variable time between 0 sec and 90 sec (parameter).
After the by pass time pump and compressor will be stopped for a determinate time (parameter) default 3' and a pre-alarm it takes on.
After the stopping time the pump re-start and then compressor too. (after a time = time pump alarm by pass).

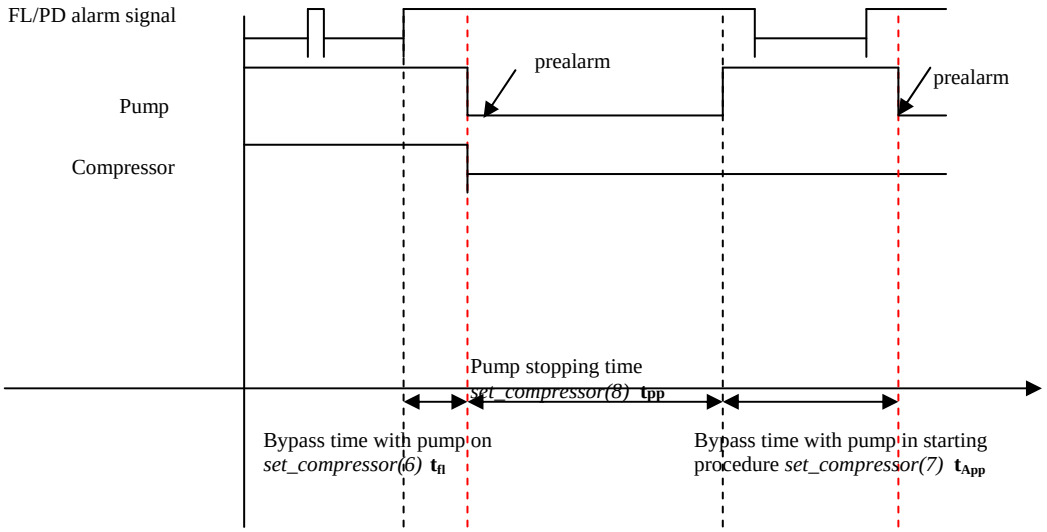
If the prealarm numbers arrive to set_maintenance®, default 0, the unit takes on a permanent alarm.

The water pump start up procedure is:

- Waiting time $\mathbf{t_{pp}}$ (*set_compressor(8)*) of stopping time unless the unit was in standy by. (the stopping time is used in case there is a FL pre-alarm)
- Starting time $\mathbf{t_{App}}$ (*set_compressor(7)*). Over this time the pump is forced to work. Compressor OFF.
- In the end of $\mathbf{t_{App}}$, if FL contact is opened a pre-alarm appears, otherwise the unit normally works.
- If the FL contact stays opened for a time $\mathbf{t_{fl}}$ *set_compressor(6)*, the pre-alarm FL comes, pump and compressor are stopped and stopping time count down is activated.



Pic 25 - prealarm fl/pd



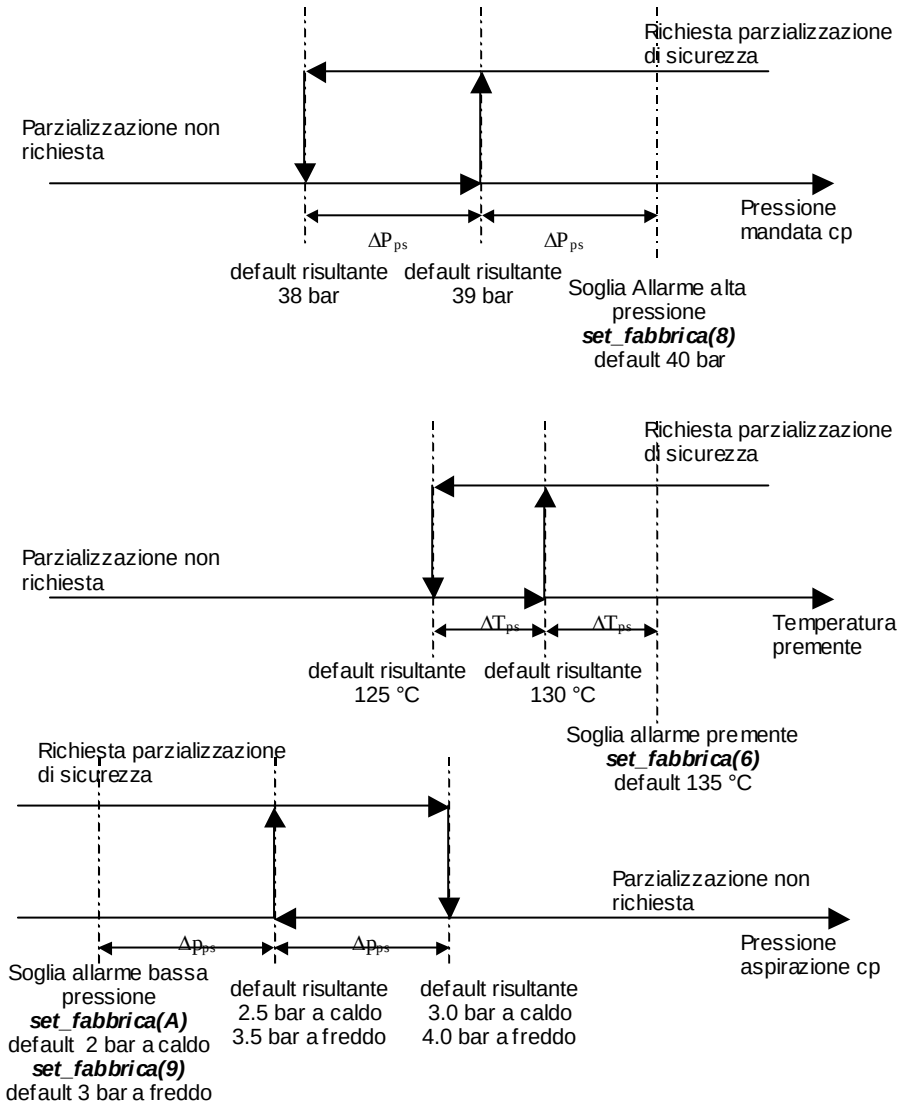
Pic. 26 – Double prealarm fl/pd

In case the unit is configurated with HDW application the FL alarm can be bypassed during the 3 way water valve movement time.

27d Safety hot gas injections: Discharge temperaure, High and Low pressure

Four parameters are setted to control HP/LP pressure and discharge temperature:

ΔP_{ps}
(differential of HP injection pressure, *set_factory(2)*, default 1 bar)
ΔT_{ps}
(differential of HDT injection pressure, *set_factory(4)*,default 5.0°C)
Δp_{ps}
(differential of LP injection pressure, *set_factory(3)*,default 0.5 bar)



Pic. 27 – requests to activate the safety hot gas injections for HP, LP and HDT

27e safety injections (single compressor)

When the safety injection is activated can be stopped according to some “exit conditions”.
A pre-alarm is always associated a safety injection.
There is a maximum number of safety injection permetted, before have a status of alarm, *set_factory(5)* default 5.
The LP safety injections are sospended during the reversing cycles and in heating during the first 3’ minutes of functioning *set_factory(H)*.

27f Safety injections (tandem compressors)

In case we have tandem compressors (ANR) the logic procedure is:

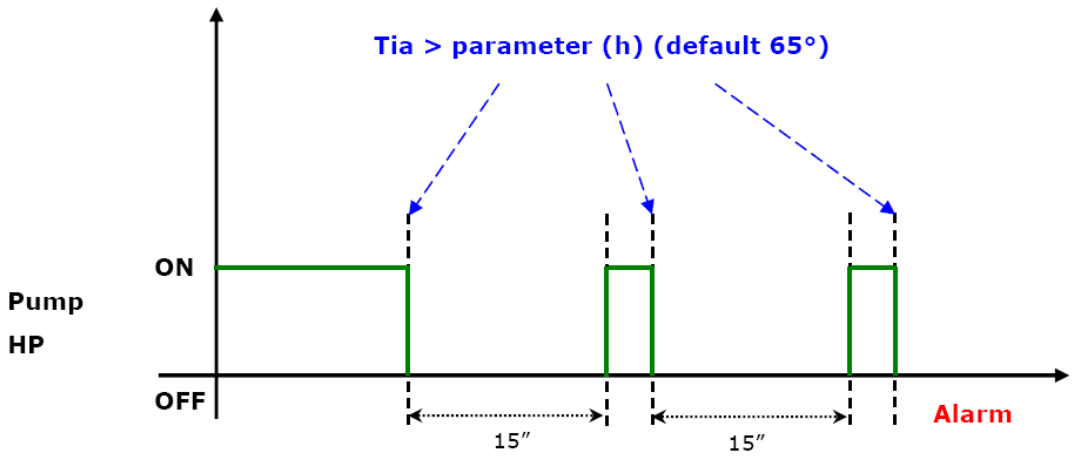
#	Step
1	Control of HP LP and HDT according to picture 39 In case safety injection is requested go to step 2**.**
2	If one CP is in operation go to step 5
3	One compressori s stopped (the cp that has a bigger working hours)
4	After 5’ (*set maintenance(4)*) is controller if the injection must be activated, if yes go to step 5
5	Injection starts and second compressori s always OFF
6	If the differential is satisfied according picture 39 the injection stops. The defrost logic control is normally activated. Go back to step 1
7	After 30’’ a new one injection in case there is a request can be done. All the alarms are always activated. Go back to step 1

Table 8 – Safety injections logic

27g Water inlet high T° alarm

Modifications: new parameter (h) added Installer menu (Pwd30)

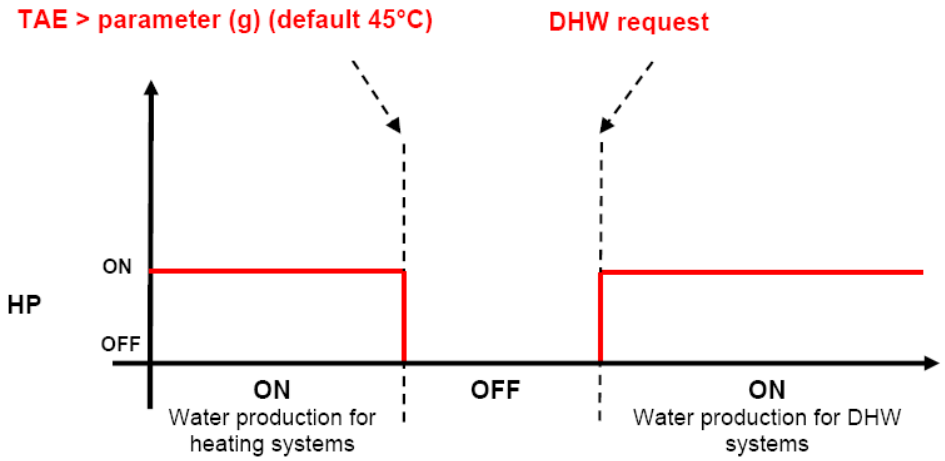
The water inlet temperature is monitored constantly. If the temperature exceeds 65° (parameter h) a pre-alarm is generated (code 55) and the pump switches off for 15'. When this time has passed, the pump switches back on and the temperature is controlled again for a maximum of 3 attempts. An alarm is generated at the third intervention and the machine is blocked.
The water inlet temperature control is always active even when the pump is off.



27h Heat Pump in stand-by with high external T°

Modifications: new parameter, new function

In heat pump functioning mode with external temperature greater than the new parameter (g) *Installer_menu* (Pwd 30) (default 45°) the heat pump goes into stand-by mode.
If DHW is requested in these conditions, the heat pump re-activates in DHW mode.



27i Cycle reverse due to gas pressing line high pressure

Modifications: new set, new pre-alarm

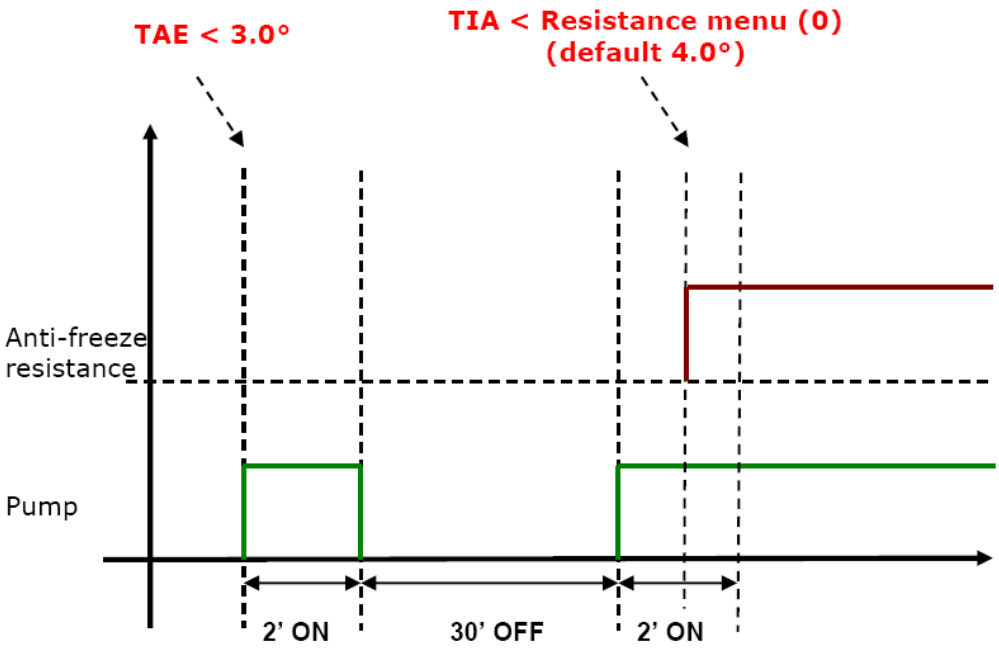
- The modifications concern **all machines** in heat pump functioning mode.
- In heating mode, if the gas pressing line temperature exceeds the safety partialisation temperature, instead of injecting gas, partialising the compressors or decreasing the frequency (respective management of ANL, ANR and ANLI) defrosting is forced by cycle reverse.
- Defrosting must not respect any minimum time from other events (start-ups, compressors, defrosting, injections...)

- If defrosting is forced before 20 mins have passed from the previous operation, *Assistance menu* (d) (Pwd83) a particular, new, pre-alarm is generated, which signals the event.
The pre-alarm does not stop the compressor, in never transforms into an alarm.

27l Antifreeze with cyclic pump activation

Modifications: setting added to existing parameter

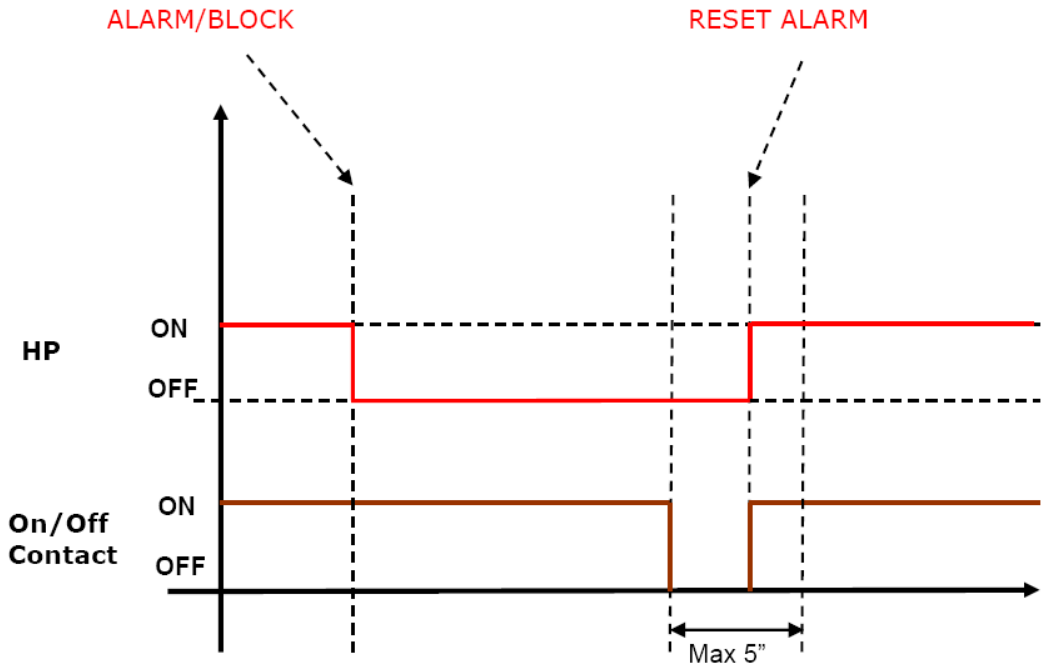
New parameter setting *Installer menu* (7) = 4 (Pwd30).
With external air temperature below 3°C, the pump is switched-on for 2' every 30' in order to read the temperature of the water in the entire system.



27m Antifreeze with cyclic pump activation

Modifications: on/off contact management modification

Reset alarms via remote on/off contact, if enabled. From the ON position, passing to OFF and returning to ON within 5', resets the alarms. MAX 3 resets every hour.
The machine cannot be put into stand-by if it is alarm conditions (all OFF). First set the alarms with "R" key.
The alarms are reset if there is a power cut.



27n Screensaver management

Impact: management modification

After 5′ from pressing the last key, the screensaver mode is activated.
In this mode, the status (On/Stand-by) and the functioning mode (Heating/Cooling) are displayed. The defrosting and the safety partialisation phases are not indicated (flashing blue LED) and not even the flashing compressor symbol for the expected time. When any key is pressed, the display immediately returns to the normal state, showing all information available.

New parameter (s) *installer menu* (Pwd30):
Screensaver functionality configuration:
0 – Screensaver disabled
1 – Screensaver displaying dashes. (to use with control panels with software before version 1.3) visible in Figure 1.
2 – Screensaver without display of dashes (to use with control panels with software from version 1.3 onwards) visible in Figure 2.

The type 1 screensaver is enables as default.

Screensaver mode with possibility of being displayed with **all** software versions of the control panel and software version 3.9.0 of the moducontrol.

Screensaver mode displayed with a new software version 3.9.0 of the moducontrol and **software version 1.3 of the control panel**.

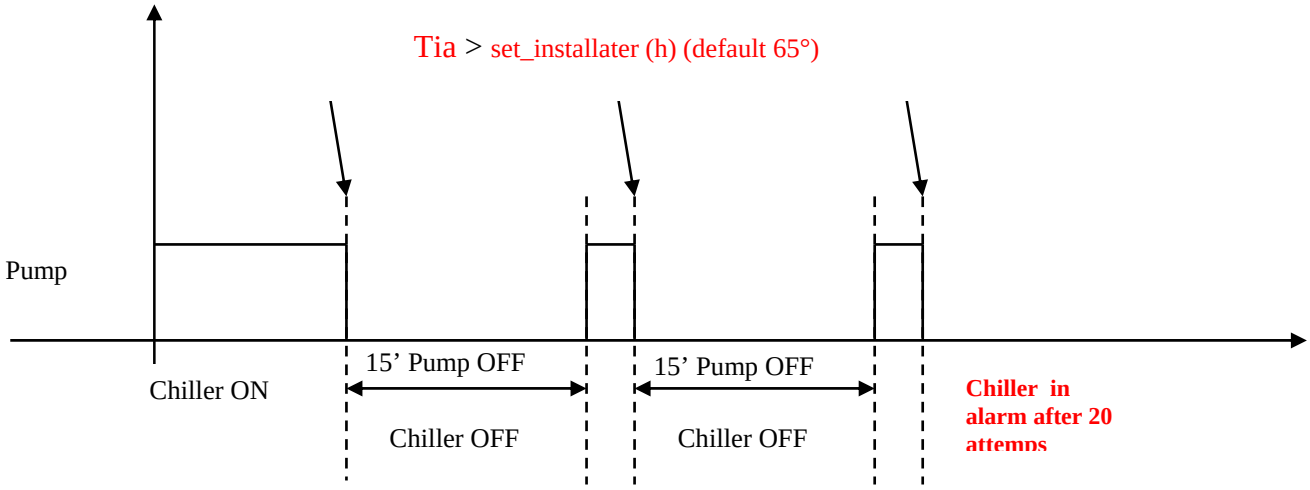
Screensaver type 2 mode with control panel software version before 1.3. The screensaver is not displayed correctly.

IN CASE OF ALARM THE BELT IN POWERED ON

27o High water temperature alarm management

Inlet water temperature is constantly monitoring. If it > 65° (parameter(H) installater menu password=030) an alarm appears (code 155) water pump is switch off for 15'.
After this time the water pump restarts to check the water temperature. Can be done 20 attemps the unit is blocked entering in status alarm.

In case DHW + E5 are connected heating water tank temperature is monitoring.
When high water temp prealarm is present the water tank sensor reading can reduce the standard stopping time (15 min).

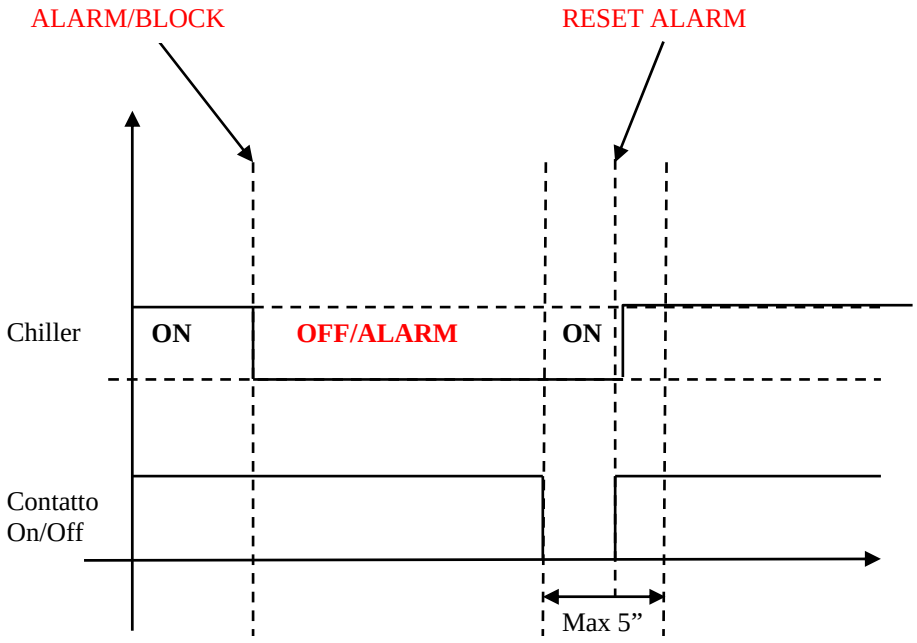


Pic 28 – High temperature alarm by water in temperature

28 ALARMS

Every time that the machine enters in an prealarm condition the red led inside the little bell begins to flash and, after some seconds the visual display goes to the historical menù alarms, where the prealarm code is showed.
The effect of the prealarm is immediate, stopping the compressor (and eventually of the hot gas injection valve) but not of other loads (we stop it in case appears prealarm 17).
If the prealarm is activated for too much time or exceeds the max. number previewed, the unit is blocked from a definitive alarm. It is possible to switch off and to switch on the unit in order to reset the alarms or **to press R for the instantaneous re-start.**

Since version 3.9.0 alarms can be resetted by remote ON/OFF contact even is enabled.
Doing a fast ON/OFF on the PR3 (max 5 sec) alarms are resetted. (max 3 times x hour)
It is impossible to put the unit in stand by if an alarm is present but before the alarm have to be resetted by botton "R".
In case power voltage is switched off alarms are resetted.



Pic 29 – Remote ON/OFF contact for alarm reset procedure

Maximum time with a prealarm activated, before the block:

set_factory ©, default 60 ‘ ‘

Maximum number of prealarm before the block:

set_factory (D), default 5

Time for the decrement of the alarms counter:

set_factory (E), default 1h

Once in block, on the visual display unit it shown “A < alarm code >” with the led bell in on. It is activated relays AE (External alarm). **Up to version 3.7**

All the alarms stop the loads (compressors, fans, water pump).
Only the pre-alarms “fan circuit braker, Pump circuit braker and flow switch” don’t stop the water pump.
The ANLI and ANR with the DHW (domestic hot water) have always the fan/pump circuit brakers in serie to compressor circuit braker

Since version 3.9.0 in case of alarm on display it isn’t showed ‘A <alarm code>’ and panel doesn’t stay blocked.
The alarm code can be seen only on historical alarm pressing (‘R’).
Relay AE is activated (output AE, terminals M1s.8– M1.8).

The codes about alarms table.

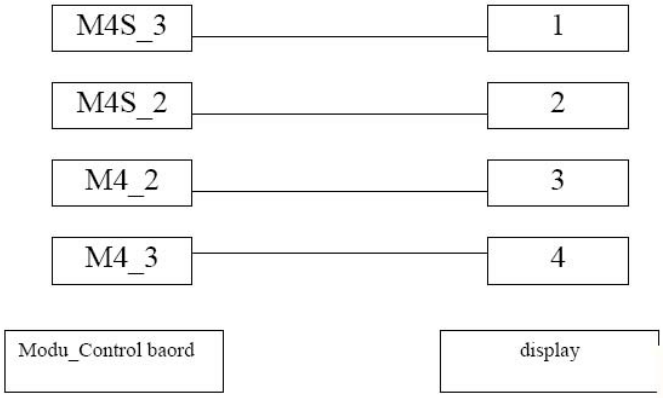
Code Alarm	Code prealarm	Meant
1	**101**	**Compressor (fan / pump) circuit braker:** this signalling takes part if the relative contact to the circuit braker switch to protect the compressor MTC is opened (table 2, contact ID1, clips M7.1 – M7.2, normally closed)
2	**102**	**fan circuit braker:** this signalling takes part if the relative contact to the circuit braker switch to protect the compressor MTV is opened (table 2, contact ID6, clips M7S.3 – M7S.4, normally closed) until SW version 3.6
3	**103**	**high pressure switch:** this alarm doesn’t give the state of the high pressure switch but the status of the compressor contactor. The high pressure switch is connected in series with the compressor contactor coil. If the card controls the compressor and the contactor does not become active after 3 sec, the pre alarm is activated. This alarm can also be caused from a defect in the operation of the compressor relays (indicated like RAP in the output on the wiring diagram). If during the operation of the compressor the contactor is opening HP alarms comes. (table 2, contact ID4, clips M7.7 – M7.8, normally closed)
4	**104**	**Flow switch / differential flow switch water:** this signalling takes part if the relative contact of flow switch or differential pressure switch. This alarm is bypassed for 40” after the pump start up. The alarm comes if the max pre-alarms numbers reached (set factory (Y) default 5. If the frost protection procedure is activated starting water pump the FL/PD controlled (table 2, contact ID2 clips M7.3 – M7.4, NC.)
5	**105**	**Low pressure switch:** this signalling takes part if the relative contact of LP switch opened. (table 2 contact ID5 clips M7S.1 – M7S.2)
6	**106**	**Inlet water probe not present:** Sensor broken or not connected

7	**107**	**Outlet water probe not present:** Sensor broken or not connected
8	**108**	**Antifreeze water:** Signalling comes when antifreeze limit is reached on the TWout (set installer (6)). Out of pre-alarm status when TWout= set-installer(6) + set factory(J) = 3+1 = 4°C In heating the alarm bypassed for 3 min, set factory(H) after compressor start up.
9	**109**	**Discharge temperature probe not present** Sensor broken or not connectet
10	**110**	**High discharge temperature** Signalling comes if sensor SP reads a T° over set-factory(6), 135°C. Out of pre-alarm status when 135- set factory (7) = 135-10=125°C
11	**111**	**HP Transducer not present** Sensor broken or not connectet. Can be also a wrong dip-switches setting
12	**112**	**High pressure alarm by trasducer** Signalling comes when the HP > set-factory(8) default 40 bar Out of pre-alarm status when set factory (8) – set factory (b)= 40-2 = 38 bar
13	**113**	**Defrost probe not present** Sensor broken or not connectet if the unit is an heat pump version
14	**114**	**LP transducer not present** Sensor broken or not connectet. Can be also a wrong dip-switches setting
15	**115**	**Low pressure alarm by trasducer:** Signalling comes when the HP > set-factory(9) default 4 bar in cooling or set-factory(a) default 2 bar in heating Out of pre-alarm status when set factory (9/a) + set factory (b). It is bypassed for 3' (set-factory(H) after the cp start up. Always bypassed during the reversing cycles
16	**-**	**Capacity alarm** Every start up of unit once the controller checks that following paragraph 7.1. Can be not enable from dip-switch
17	**117**	**Circuit braker alarm (water pump)** this signalling takes part if the relative contact of pump circuit braker MTP. (table2, contact ID3, clips M7.5 – M7.6, NC). Until software version 3.6
18	**118**	**Injection alarm for HP** It is done everytime reached the parameters about paragraph 7.4. The unit enter in alarm after max number of injection, set factory (5) default 5. With inverter unit indicates an injection for high compression ratio too.

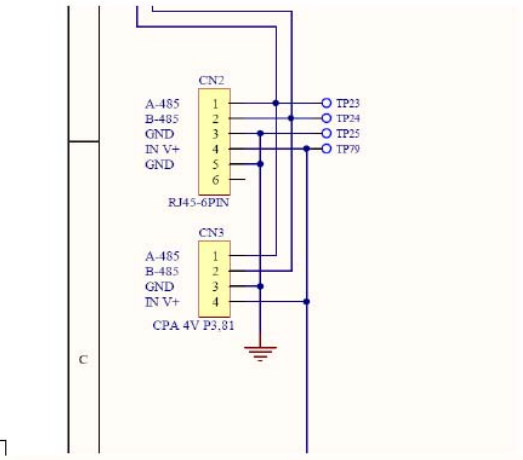
19	**119**	**Injection alarm for LP** It is done everytime reached the parameters about paragraph 7.4. The unit enter in alarm after max number of injection, set factory (5) default 5.
20	**120**	**Injection alarm for high discharge T°** It is done everytime reached the parameters about paragraph 7.4. The unit enter in alarm after max number of injection, set factory (5) default 5.
21	**121**	**Error bemf:** Error on the back emf measure. It appears if the compressor has difficult to start. (cod. long 4 or cod long 20) Check power cp wires, EXV, cp full of liquid **ANR: 4 way valve blocked only on SW3.75**
22	**122**	**Internal comunication error** Inverter board is broken (cod. longertek 5)
23	**123**	**High Current:** compressor absorbs too high current (cod. longertek 6)
24	**124**	**Low load demand:** too low absorbtion current value, maybe compressor is working in by pass (cod. longertek 7)
25	**125**	**Voltage value not correct:** the inverter board indicates a failure on the bus-voltage value (cod. longertek 8)
26	**126**	**Start up error:** the inverter board has indicated a mistake into the start up procedure (false start up motor PMSM cod. longertek 9)
27	**127**	**IPM error:** error on the IGBT (cod. longertek 12)
28	**128**	**EEPROM error:** eeprom error into the inverter board
29	**129**	**Compressor blocked:** cod. longertek 16
30	**130**	**Comunication not present:** The inverter board doesn't give any answer. The power supply it isn't connected or serial cable is not connected or A and B signals are opposited. Not change inverter param when cp works. Stop the unit and restart
31	**131**	**PFC module:** PFC modul error cod longertek 23 Check the cable connection on PFC board and compressor or to replace PFC board or the diod To exclude temp problem on PFC board to try to limit the working frequency MENU CP pass 72 "PAR C"
32	**132**	**Only ANLI100 :** Cooling louvered fins overheating (code APY1)

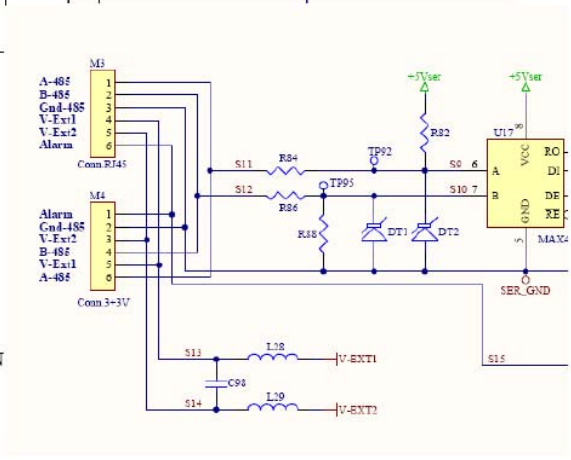
33	**133**	**Only ANLI100 :** Overcurrent in acceleration. Hardware error (code APY2)
34	**134**	**Only ANLI100 :** Overcurrent at constant speed. Hardware error (code APY3)
35	**135**	**Only ANLI100 :** Overcurrent in deceleration. Hardware error (code APY4)
36	**136**	**Only ANLI100 :** Undervoltage on the DC bus (code APY5)
37	**137**	**Only ANLI100 :** Overvoltage on the DC bus (code APY6)
40	**140**	**Only ANLI100 :** PFC converter fault error in the PFC module. Software error (code APY9)
41	**141**	**Only ANLI100 :** Overcurrent in acceleration.code APY10. check wired sequency
42	**142**	**Only ANLI100 :** Overload (code APY11)
43	**143**	**Only ANLI100 :** Overcurrent at constant speed. Software error (code APY12)
44	**144**	**Only ANLI100 :** Overcurrent in deceleration. Software error (code APY13)
45	**145**	**Only ANLI100 :** Compressor didn't connect correctly (code APY14)
46	**146**	**Only ANLI100** : No communication (APY15)
47	**147**	**Only ANLI100 :** Cooling louvered findstemperature sensor error (APY16)
51	**151**	**Only ANLI100 :** Strange condition reduced frequency by overcurrent or overheating protection. (code APY20) Check connections (U/V/W) and fixation of *power wires*
54	**154**	**4 way valve blocked.**
55	**155**	**High inlet water T°.** *Twin* > *se*t_installer(H). Boyler in the same system. After 3 prealarms the unit enter in alarm status.
---	**156**	**Reversing cycle by high discharge T°>130°.** Defrost done without respecting normal times/parameters.**This pre-alarm doesn't stop the cp and there are not number limit.**
57	**157**	**Error about remote probe on DHW.** This prealarm means remote probe broken or communication problem on DHW. Alarm will be activated only if parameter(8)=4 password = 030.

58	**158**	**Error about air external probe.** This prealarm means that air external probe when DCPX is activated can be broken or unit is an heat pump ***only visualization***
SERIAL		When display shows SERIAL communication between moducontrol and display is lost. Verify if plugs are fixed correcty, if they are cleaned and if cable is ok Try to connect display and Modu by twisted cable, see drawing below
ILLEGAL DATA ADDRESS		The data request has a wrong address not available on moducontrol
ILLEGAL DATA VALUE		The request of data writing has a value out of range and can't be wrote.



TWISTED SHARED CABLE MODUCONTROL-DISPLAY CONNECTION





The terminals M4-2 and M4-3 can be used to powered panel E5

29 Common ANL SPARE PARTS codes

DESCRIPTION OF COMPONENT	SPARE PART CODE
Controller modu-control	9113036
Display	9112770
Connection cable	9112744
Trasducers HP/LP	9112747
Fans	9113916 (ANL020-025)
Fans	9113915 (ANL030-090)
Water pumps	9105955 (ANL020-040)
Water pumps	9104000 (ANL050-090)
DCPX	9105184
Handle front panel	9108722
Probes	9105961
Discharge probe	9112745
High pressure switch 42 bar	9112746
Low pressure switch 2 bar	9111422

29a Common ANR SPARE PARTS codes

DESCRIPTION OF COMPONENT	SPARE PART CODE
Controller modu-control	9113036
Display	9112770
Connection cable	9112744
Trasducers HP/LP	9112747
Fans	9113915
DCPX	9105184
Handle front panel	9108722
Probes	9105961
Discharge probe	9112745
High pressure switch 28 bar	9111423

29b Common ANLI SPARE PARTS codes

DESCRIPTION OF COMPONENT	SPARE PART CODE
Controller modu-control	9113036
Display	9112770
Connection cable	9112744
Trasducer HP **NSK=BE0501**	9112747
Trasducer LP **PT4-18M**	9114948
Fans	9113915
DCPX	9105184
Handle front panel	9108722
Probes	9105961
Discharge probe	9112745
High pressure switch 42 bar	9112746

29c Common ANF SPARE PARTS codes

DESCRIPTION OF COMPONENT	SPARE PART CODE
Controller modu-control	9113036
Display	9112770
Connection cable	9112744
Fans	9113915
Handle front panel	9108722
Probes	9105961
Discharge probe	9112745

29d Common ANF-P SPARE PARTS codes

DESCRIPTION OF COMPONENT	SPARE PART CODE
Controller modu-control	9113036
Display	9112770
Connection cable	9112744
Fans	9113915
Handle front panel	9108722
Probes	9105961
Discharge probe	9112745
Water pump	9105955

29e Common SRP SPARE PARTS codes

DESCRIPTION OF COMPONENT	SPARE PART CODE
Controller modu-control	9113036
Display	9112770
Connection cable	9112744
Sequency phase relay	9105157
HP switch	9115173
LP switch	9112449
Discharge sensor	9114818
Discharge thermo-protection	9108050
Water sensor	9114817
Air exchanger sensor	9106849

30 Probes table

Table of ohmmic values about NTC probes
T° = 25°C probe value = 10 Kohm +/- 1%

°C	Sonda	°C	Sonda	°C	Sonda	°C	Sonda
-50	359408,6	**-9**	40559,96	**23**	10769,75	**64**	2670,285
-49	335625,1	**-8**	38773,06	**24**	10371,01	**65**	2589,295
-48	313872,7	**-7**	37073,87	**25**	9989,155	**66**	2511,055
-47	293933,8	**-6**	35457,69	**26**	9623,39	**67**	2435,46
-46	275617,7	**-5**	33920,08	**27**	9272,961	**68**	2362,405
-45	258757	**-4**	32456,89	**28**	8937,149	**69**	2291,794
-44	243204,9	**-3**	31064,18	**29**	8615,271	**70**	2223,534
-43	228831,7	**-2**	29738,25	**30**	8306,681	**71**	2157,534
-42	215523,6	**-1**	28475,62	**31**	8010,764	**72**	2093,709
-41	203179,5	**0**	27273	**32**	7726,935	**73**	2031,977
-40	191710,4	**0,1**	27155,92	**33**	7454,64	**74**	1972,26
-39	181037	**0,2**	27039,4	**34**	7193,35	**75**	1914,482
-38	171089,1	**0,3**	26923,45	**35**	6942,564	**76**	1858,573
-37	161804,1	**0,4**	26808,05	**36**	6701,807	**77**	1804,463
-36	153126	**0,5**	26693,22	**37**	6470,625	**78**	1752,086
-35	145004,8	**0,6**	26578,93	**38**	6248,588	**79**	1701,379
-34	137395,7	**0,7**	26465,2	**39**	6035,286	**80**	1652,282
-33	130258,5	**0,8**	26352,02	**40**	5830,33	**81**	1604,736
-32	123556,8	**0,9**	26239,38	**41**	5633,349	**82**	1558,686
-31	117257,9	**1**	26127,28	**42**	5443,991	**83**	1514,08
-30	111332,2	**2**	25035,54	**43**	5261,921	**84**	1470,864
-29	105752,7	**3**	23995	**44**	5086,819	**85**	1428,992
-28	100495,1	**4**	23003,05	**45**	4918,383	**86**	1388,414
-27	95537	**5**	22057,22	**46**	4756,323	**87**	1349,088
-26	90858,18	**6**	21155,17	**47**	4600,363	**88**	1310,968
-25	86440	**7**	20294,69	**48**	4450,242	**89**	1274,013
-24	82265,39	**8**	19473,69	**49**	4305,709	**90**	1238,184
-23	78318,7	**9**	18690,2	**50**	4166,528	**91**	1203,441
-22	74585,47	**10**	17942,33	**51**	4032,472	**92**	1169,748
-21	71052,41	**11**	17228,32	**52**	3903,324	**93**	1137,07
-20	67707,2	**12**	16546,48	**53**	3778,88	**94**	1105,372
-19	64538,47	**13**	15895,24	**54**	3658,942	**95**	1074,622
-18	61535,65	**14**	15273,08	**55**	3543,325	**96**	1044,788
-17	58688,94	**15**	14678,57	**56**	3431,849	**97**	1015,839
-16	55989,22	**16**	14110,37	**57**	3324,344	**98**	987,7472
-15	53428	**17**	13567,19	**58**	3220,649	**99**	960,4835
-14	50997,34	**18**	13047,81	**59**	3120,609	**100**	934,0211
-13	48689,87	**19**	12551,09	**60**	3024,076		
-12	46498,66	**20**	12075,94	**61**	2930,908		
-11	44417,25	**21**	11621,31	**62**	2840,972		
-10	42439,58	**22**	11186,23	**63**	2754,139		

Length 3 meters spare part code **9106849**
Length 6 meters spare part code **9106994**
Length 12 meters spare part code **9107494**
Length 16 meters spare part code **9112238**

Discharge sensor curve 3.3 kohm at 25°C

Temp	Curva R-T Type **D**		
	min	nom	max
0	145.554	162.212	180.614
5	113.454	125.779	139.318
10	89.135	98.322	108.358
15	70.560	77.454	84.946
20	56.258	61.645	67.094
25	45.163	49.120	53.375
30	36.494	39.517	42.753
35	29.674	31.996	34.469
40	24.273	26.065	27.964
45	19.969	21.358	22.823
50	16.518	17.599	18.733
55	13.735	14.579	15.461
60	11.479	12.140	12.828
65	9.640	10.159	10.697
70	8.133	8.541	8.963
75	6.892	7.214	7.545
80	5.865	6.120	6.380
85	5.012	5.213	5.418
90	4.300	4.459	4.620
95	3.703	3.829	3.955
100	3.201	3.300	3.399
105	2.761	2.854	2.948
110	2.390	2.477	2.566
115	2.076	2.158	2.241
120	1.810	1.886	1.963
125	1.582	1.652	1.725
130	1.387	1.452	1.521
135	1.220	1.281	1.343
140	1.076	1.132	1.191
145	952	1.004	1.058
150	844	893	943

30 Ratiometric trasducers table

Pressure (bar)	Volt (V)
0	0.51
1	0.59
2	0.67
3	0.75
4	0.84
5	0.92
6	1.00
7	1.08
8	1.16
9	1.25
10	1.33
11	1.41
12	1.49
13	1.57
13	1.65
14	1.66
15	1.74
16	1.82
17	1.90
18	1.98
19	2.06
20	2.15
21	2.23
22	2.31
23	2.39
24	2.47
25	2.55
26	2.63
27	2.71
28	2.80
29	2.88
30	2.96
31	3.04
32	3.12
32	3.20
33	3.21
34	3.29
35	3.37
36	3.45
37	3.53
38	3.62
39	3.70
40	3.78
41	3.86
42	3.94
44	4.11
46	4.27
48	4.43
50	4.60

30 Freon table

R 407C REFRIGERANT GAS TECHNICAL FEATURES

Pressione (barA)	*Pressione (barR)*	*Temp. p.to rug. (°C)* Dew point	*Temp. p.to bolla (°C)* Bubble point
1	*0*	-37,1	-44,26
1,5	*0,5*	-28,45	-35,45
2	*1*	-21,83	-28,71
2,5	*1,5*	-16,4	-23,17
3	*2*	-11,75	-18,43
3,5	*2,5*	-7,66	-14,27
4	*3*	-4	-10,54
4,5	*3,5*	-0,68	-7,15
5	*4*	2,37	-4,03
5,5	*4,5*	5,19	-1,14
6	*5*	7,82	1,55
6,5	*5,5*	10,29	4,08
7	*6*	12,62	6,47
7,5	*6,5*	14,82	8,73
8	*7*	16,92	10,87
8,5	*7,5*	18,91	12,93
9	*8*	20,82	14,89
9,5	*8,5*	22,65	16,77
10	*9*	24,4	18,58
10,5	*9,5*	26,09	20,32
11	*10*	27,72	22
11,5	*10,5*	29,29	23,62
12	*11*	30,81	25,19
12,5	*11,5*	32,28	26,72
13	*12*	33,71	28,19
13,5	*12,5*	35,1	29,63
14	*13*	36,44	31,03
14,5	*13,5*	37,75	32,39
15	*14*	39,03	33,71
15,5	*14,5*	40,27	35,01
16	*15*	41,48	36,27
16,5	*15,5*	42,67	37,5
17	*16*	43,82	38,71
17,5	*16,5*	44,95	39,89
18	*17*	46,05	41,04
18,5	*17,5*	47,13	42,18
19	*18*	48,19	43,28
19,5	*18,5*	49,23	44,37
20	*19*	50,24	45,44
20,5	*19,5*	51,24	46,49
21	*20*	52,21	47,52
21,5	*20,5*	53,17	48,53
22	*21*	54,11	49,52
22,5	*21,5*	55,03	50,5
23	*22*	55,94	51,46
23,5	*22,5*	56,83	52,4
24	*23*	57,71	53,34

Superheating calculation = Suction Temperature – Dew point Temperature
Example: Suction Temperature = 7,4°C, Suction Pressure = 4bar
Superheating calculate = 7,4°C – 2,37°C = 5,03

Subcooling calculation = Bubble point temperature – Liquid temperature
Example: High pressure = 16bar, Liquid Temperature = 33°C
Subcooling calculate = 38,71°C – 33,0°C = 5,71°C

R 410A REFRIGERANT GAS TECHNICAL FEATURES

Pressione (barA)	Pressione (barR)	Temperatura (°C)	Pressione (barA)	Pressione (barR)	Temperatura (°C)
6,8573	5,8573	-5	23,7712	22,7712	39
7,0868	6,0868	-4	24,3559	23,3559	40
7,322	6,322	-3	24,9516	23,9516	41
7,563	6,563	-2	25,5585	24,5585	42
7,8101	6,8101	-1	26,1767	25,1767	43
8,0632	7,0632	0	26,8064	25,8064	44
8,3224	7,3224	1	27,4478	26,4478	45
8,5879	7,5879	2	28,1011	27,1011	46
8,8597	7,8597	3	28,7665	27,7665	47
9,138	8,138	4	29,4442	28,4442	48
9,4228	8,4228	5	30,1343	29,1343	49
9,7143	8,7143	6	30,8372	29,8372	50
10,0125	9,0125	7	31,553	30,553	51
10,3176	9,3176	8	32,282	31,282	52
10,6295	9,6295	9	33,0244	32,0244	53
10,9486	9,9486	10	33,7805	32,7805	54
11,2748	10,2748	11	34,5505	33,5505	55
11,6082	10,6082	12	35,3348	34,3348	56
11,949	10,949	13	36,1336	35,1336	57
12,2973	11,2973	14	36,9473	35,9473	58
12,6531	11,6531	15	37,7761	36,7761	59
13,0167	12,0167	16	38,6206	37,6206	60
13,388	12,388	17	23,7712	22,7712	39
13,7672	12,7672	18	24,3559	23,3559	40
14,1545	13,1545	19	24,9516	23,9516	41
14,5499	13,5499	20	25,5585	24,5585	42
14,9535	13,9535	21	26,1767	25,1767	43
15,3655	14,3655	22	26,8064	25,8064	44
15,786	14,786	23	27,4478	26,4478	45
16,2151	15,2151	24	28,1011	27,1011	46
16,6529	15,6529	25	28,7665	27,7665	47
17,0995	16,0995	26	29,4442	28,4442	48
17,5552	16,5552	27	30,1343	29,1343	49
18,0199	17,0199	28	30,8372	29,8372	50
18,4938	17,4938	29	31,553	30,553	51
18,9772	17,9772	30	32,282	31,282	52
19,47	18,47	31	33,0244	32,0244	53
19,9724	18,9724	32	33,7805	32,7805	54
20,4846	19,4846	33	34,5505	33,5505	55
21,0068	20,0068	34	35,3348	34,3348	56
21,5389	20,5389	35	36,1336	35,1336	57
22,0813	21,0813	36	36,9473	35,9473	58
22,634	21,634	37	37,7761	36,7761	59
23,1973	22,1973	38	38,6206	37,6206	60

AERMEC
COMPANY QUALITY SYSTEM
ICIM
ISO 9001 - Cert. n°0128/1
CISQ
IQNet
AERMEC S.P.A.